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FINAL REPORT

TABLE OF STELLAR RADIAL VELOCITIES DETERMINED AT THE ALLEGHENY OBSERVATORY  
IN THE YEARS 1906-1917

AD 740730

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Wallace R. Beardsley

Astronomer

Allegheny Observatory

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13. ABSTRACT

A total of 3144 unpublished radial velocity measures of stars were in the files of the Allegheny Observatory. These were all from the era 1906-1917 and constitute a valuable contribution to our knowledge of radial velocities of stars. A total of 130 stars are represented, most of which are binary stars. Many of these binary stars have remained unsolved over the years because of lack of similar published data. The measures, themselves, were mostly raw measures without reduction and velocity calculations. The work of reducing these measures and calculating the respective radial velocities is now complete. Final typing of the manuscript is now in process. Publication will be in the Supplements to the Astrophysical Journal or the Publications of the Allegheny Observatory. Copies of the publication will be submitted to the Geography Branch, Office of Naval Research when available.

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Star	HD Number	Name	RA	RV	pe	Wt.	RV	sec	IS	Wt.	Ms'r.	Remarks	Spectral Type
No.	Plate No.	Date	JD	RV	pe	Wt.	RV	sec	IS	Wt.	Ms'r.	Remarks	Spectral Type
Sky													
1	517	1907 May 28.190	2417724.190	- 0.9	$\pm 1.7$	7					B	HA 0 <sup>h</sup> 46 <sup>m</sup> E	G2V
2	522	28.370	7724.370	- 1.8	$\pm 0.1$	7					B	HA 3 23 W	
3	523	28.384	7724.384	- 2.6	0.5	6					B	HA 3 53 W	
4	525	28.426	7724.426	- 0.8	0.6	5					B	HA 4 54 W	

This series shows an interesting run with hour angle which may be attributed to flexure. It also indicates that intrinsic errors in the spectrograph were small in 1907. These plate measures, as well as those of  $\theta$  Aql and  $\delta$  Ori, represent a selected portion of a lengthy measurement of lines on each plate used by Baker to set up the general reduction table (Publ.A. O. 1, 9, 1907.)

2	HD 1256	$\theta$ Andromedae	$\alpha = 0^h 11^m 52^s$	$\delta = +38^\circ 8'$	A2V		
1	3160	1909 Nov 1.595	2418612.595	- 2.8	$\pm 7.7$	6	J
2	3162	2.573	8613.573	-19.9	4.7	7	J
3	3227	14.585	8625.585	- 8.9	1.0	5	J
4	4719	1911 Aug 20.843	9269.843	+ 2.9	2.2	8	J
5	5977	1913 Sep 1.756	2420012.756	+ 8.4	1.5	18	J
			Mean $\pm 1.3$				J mean of 2

Previously published radial velocities also show a range of about  $\pm 10$  to  $-20$  km/sec. This star may possibly be a spectroscopic binary of small amplitude.

	HD 1404		$\sigma$ Andromedae	$\alpha = 0^h 13^m 6^s$	$\delta = +36^\circ 14'$	A2V			
1	3702	1910 Aug	5.785	2418889.785	-10.4	+7.6	3	J	
2	3719		11.767	8895.767	-19.5	4.8	6	J	
3	3727		12.796	8896.796	+5.8	4.1	5	J	
4	3755		26.741	8910.741	+6.6	3.8	5	J	
5	3762		27.714	8911.714	+2.8	4.3	6	J	
6	3769		28.783	8912.783	+0.2	6.0	4	J	Comparison weak on one side
7	3798	Sep	11.728	8926.728 (+34.2)			2	J	Weak spectrum; one line only
8	3803		14.756	8929.756	-11.7	3.2	3	J	
9	3809		15.712	8930.712	-4.5	4.3	5	J	
10	3822		21.733	8936.733	-7.3	1.7	5	J	Comparison weak
11	3844		28.728	8943.728	-19.3	6.1	4	J	
12	3860		30.712	8945.712	-12.0	5.4	6	J	
13	3864	Oct	1.703	8946.703	-1.4	23.3	2	J	Spectrum weak; very poor lines
14	3870		2.709	8947.709	-19.6	4.9	5	J	
15	3884		8.658	8953.658	-7.6	4.4	6	J	
16	3895		10.681	8955.681	-20.4	4.9	5	J	
17	3906		11.715	8956.715	-22.1	5.8	6	J	
18	3915		12.640	8957.640	-14.2	7.9	3	J	
19	3924		13.676	8958.676	+6.7	1.7	5	J	
20	3932		14.651	8959.651	-14.8	5.2	6	J	

21	3939	15.650	8960.650	+12.3	+1.6	6	J
22	3945	17.594	8962.594	- 1.9	4.8	4	J
23	3951	18.635	8963.635	-12.9	8.7	3	J
24	3957	19.670	8964.670	-19.0	4.2	6	J
25	3975	23.656	8968.656	- 9.9	3.6	6	J
26	3983	25.656	8970.656	-15.3	4.0	4	J
27	3988	29.597	8974.597	-17.9	2.5	4	J
28	4021	Nov 8.588	8984.588	-11.1	6.1	4	J
29	4040	20.584	8996.584	-17.3	2.1	5	J
30	4053	26.572	9002.572	- 0.2	3.9	5	J
31	4079	Dec 13.574	9019.574	- 4.0	1.9	4	J
32	4086	14.505	9020.505	-12.8	3.6	6	J
33	4104	17.490	9023.490	-18.6	3.1	4	J
34	4114	21.546	9027.546	-11.5	6.1	5	J Wide slit
35	4121	25.488	9031.488	-10.6	3.2	4	J
36	4124	27.490	9033.490	- 8.4	2.9	4	J
37	4134	1911 Jan 5.454	9042.454	-10.2	1.9	5	J

This star is evidently a spectroscopic binary of very short period. One plate per night, despite the good run in October, is insufficient to define the period. The star is being observed on the present program at Allegheny Observatory. Announced as a spectroscopic binary by Lee (Ap.J. 32, 300, 1910).

F8V

 $\delta = +53^{\circ}37'$  $\alpha = 0^{\text{h}}30^{\text{m}}6^{\text{s}}$ 

HD 3240

1	3183	1909 Nov	4.664	2418615.664	-14.8	+3.2	7	D
2	3236		15.591	8626.591	-18.7	3.4	7	D
3	4711	1911 Aug	19.866	9268.866	-10.2	2.7	6.5	D
4	4978	Dec	6.552	9377.552	-1.4	2.9	9	D

Mean -10.6

No Discussion

HD4142

 $\alpha = 0^{\text{h}}38^{\text{m}}9^{\text{s}}$  $\delta = +47^{\circ}19'$ 

B5V

1	3941	1910 Oct	15.745	2418960.745	-15.6	+7.3	5	D
2	4004		31.596	8976.596	-87.0	4.9	5	D
3	4012	Nov	4.684	8980.684	-41.6	3.1	5	D
4	4929	1911 Nov	10.562	9351.562	-70.1	4.5	7	D
5	4936		13.564	9354.564	-57.9	3.5	7	D
6	4959		26.553	9367.553	-70.6	3.3	6	D

Mean -58.3

Previously published radial velocities fall within the range -15 to -87 km/sec observed here. This star is probably a spectroscopic binary.

HD 6653

 $\alpha = 1^{\text{h}}2^{\text{m}}16^{\text{s}}$  $\delta = +43^{\circ}25'$ 

A2m?

1	3228	1909 Nov	14.617	2418625.617	+7.4	$\pm 2.6$	15	D
2	4733	1911 Aug	22.819	9271.819	+7.8	3.5	11	D

	3	4876	1911 Oct	19.751	2419329.751	+ 3.7	±2.7	6.5		D	underexposed
	4	4956	Nov	22.642	9363.642	- 4.3	1.9	10.5		D	
	5	4965		30.603	9371.603	+ 6.1	2.1	16		D	
	6	5998	1913 Sep	9.742	2420020.742	+16.4	2.1	13		D	

Mean + 6.8

No Discussion

9	HD 6972	32 Cassiopeiae	$\alpha = 1^h 5^m 10^s$	$\delta = +64^\circ 29'$	B8					
1	2154	1908 Nov	9.628	2418255.628	-10.7	±6.8	5	J		
2	2164		12.549	8258.549	- 1.2	3.9	7	J, Sch1		Mean of three measures
3	2175		13.626	8259.626	+13.0	3.1	5	J		
4	2198		20.526	8266.526	+ 8.3	4.2	4	J, Sch1		Mean of two measures
5	2205		20.720	8266.720	+ 3.5	3.5	5	J, Sch1		Mean of two measures
6	2278	1909 Jan	1.600	8308.600	+11.7	3.5	3	J		Seed 23
7	4986	1911 Dec	7.616	9378.616	-13.2	1.4	13	J		
8	4992		19.618	9390.618	+18.8	3.4	6	J		
9	5020	1912 Jan	13.485	9415.485	+ 7.5	1.4	4	J		
10	5023		16.511	9418.511	-18.4	6.0	6	J		

Mean - 0.9

No Discussion

10	HD 11241	1 Persei	$\alpha = 1^h 45^m 25^s$	$\delta = 54^\circ 39'$	B2V				
1	5448	1912 Sep	16.728	2419662.728	- 5.5	±5.5	9	D	

2	5457	1912 Sep	20.700	9666.700	-17.6	+5.2	8	+ 4.8	2	D
3	5471		29.716	9675.716	-29.5	4.5	8	-11.7	1	D
4	5504	Oct	14.666	9690.666	- 7.5	4.4	8		2	D
5	5508		15.647	9691.647	-22.7	4.6	8	+19.1	1	D
6	5519		17.680	9693.680	- 6.8	4.4	6			D
7	5522		25.753	9701.753	-44.4	2.9	4			D underexposed
8	5531		27.645	9703.645	- 9.4	9.7	5	-14.6	2	D
9	5562	Nov	18.588	9725.588	-14.7	5.0	6	- 6.1	1	D
10	5588		30.563	9737.563	-10.3	4.4	10	-12.7	2	D
11	5600	Dec	12.538	9749.538	-46.3	4.9	5	+ 2.0	2	D
12	5607		13.524	9750.524	-48.9	2.3	4			D
13	5615		25.564	9762.564	+ 2.3	4.3	8	-13.1	1	D
14	5627	1913 Jan	9.535	9777.535	-23.7	3.2	8	+19.4	1	D
15	5631		14.510	9782.510	- 8.8	5.3	7			D
16	5963	Aug	27.823	2420007.823	-12.8	3.4	6	+ 5.2	1	D
17	5966		29.787	0009.787	-43.2	8.1	6			D
18	5974		31.823	0011.823	-15.8	4.2	8	-14.4	1	D
19	5978	Sep	1.805	0012.805	-20.4	6.9	7	+12.6	2	D
20	5995		8.808	0019.808	+ 8.6	2.7	6	+29.3	1	D
21	5999		9.814	0020.814	- 1.8	9.3	5			D
22	6010		23.733	0034.733	-21.6	6.1	6			D
23	6027	Oct	4.752	0045.752	+43.8	6.4	5	+ 8.8	1	D

24	6030	6.785	0047.785	-11.9	+1.9	6	+ 5.1	3	D
25	6038	8.700	0049.700	-27.0	3.1	8	+30.6	1	D
26	6042	9.819	0050.819	- 9.3	2.3	7			D
27	6050	14.683	0055.683	+ 0.8	2.3	6			D
28	6053	15.681	0056.681	-18.8	2.2	5			D
29	6058	31.712	0072.712 (+23.0)	14.5		5	- 9.0	1	Broad Dust Ban D
30	6063	Nov 2.688	0074.688	- 2.7	2.4	6	-30.7	1	D
31	6068	4.592	0076.592	-11.6	3.8	8	+ 8.6	1	D
32	6071	5.721	0077.721	- 9.4	3.8	8	+33.0	1	D
33	6077	6.714	0078.714	-25.3	4.6	8			D
34	6080	14.552	0086.552	-48.6	10.0	5			D
35	6088	17.669	0089.669	-10.0	3.0	7	(-21.7)	1	I.S. Possibly a spot D
36	6092	20.644	0092.644	+17.8	5.0	6	+ 8.1	1	D
37	6099	21.651	0093.651	-14.8	5.2	4	+17.7	1	D
38	6125	Dec 12.617	0114.617	-12.4	6.1	7			D
39	6137	15.575	0117.575	- 0.8	6.8	7	+ 7.0	2	D
40	6144	19.581	0121.581	+ 4.7	6.3	5	-15.3	1	D
41	6150	22.592	0124.592	- 7.0	5.3	3			Underexposed D
42	6163	1914 Jan 29.556	0162.556	-19.9	3.1	4			D
43	6166	Feb 1.510	0165.510	-27.3	5.4	5			D
44	6514	Sep 28.830	0404.830	-17.2	11.7	3			D
45	6538	Oct 19.798	0425.798	-18.7	7.7	8	- 6.4	2	D

46	6556	Nov	2.765	0439.765	- 6.6	$\pm 3.1$	8	D
47	6559		3.684	0440.684	+ 0.6	5.0	9	D
48	6564		6.768	0443.768	- 7.2	7.2	3	D
49	6585		27.750	0464.750	-23.2	4.4	7	D
50	6593	Dec	17.639	0484.639	+29.9	11.6	3	D
51	6600		28.576	0495.576	+36.3	8.5	3	D
52	6604	1915 Jan	4.570	0502.570	- 7.2	2.8	6	D
53	6608		5.567	0503.567	- 3.6	3.7	3	D
54	6613		8.554	0506.554	+33.9	5.1	6	D
55	6614		15.538	0513.538	+ 5.9	8.1	6	D
56	6832	Oct	12.798	0783.798	-18.3	6.2	5	D
57	6840		21.723	0792.723	- 1.0	4.2	6	D
58	6865	Nov	9.728	0811.728	-51.8	4.6	10	D
59	6875		26.611	0828.611	- 6.1	4.3	5	D
				Mean	-12.1			
				Mean I.S.	+ 2.0			

The velocity variation for this star appears to be real. Published velocities of other observatories (notably Ottawa, Publ. D.O. 4, 253, 1918) show a similar range from about +40 to -60 km/sec. Observations were made at both Allegheny and at Ottawa on September 28, 1914 about 30 minutes apart. The Ottawa velocity is +28 km/sec, the Allegheny velocity as published is -17 km/sec. The Allegheny result is influenced by a strongly negative value for  $H_\gamma$  which appears double. If this line were to be omitted then the velocity would be more nearly 0 km/sec. It is possible that this star has a very short period of variation of about the same order as a  $\beta$  Canis Majoris star. Further investigation is needed.

HD 358

 $\alpha$  Andromedae $\alpha = 0^h 3^m 13^s$  $\delta = +28^\circ 32'$ 

B9 p

A series of 34 radial velocities were determined for the season 1915-16. Analysis of these velocities show an apparent  $\delta$ -velocity of -16 km/sec. This suggestion of a possible third body in the system is being further investigated by means of several recent series of this star made here at the Allegheny Observatory. The 1915-16 velocities will be published at a future date in conjunction with the present investigations.

5 HD 4058

 $\pi$  Cassiopeiae $\alpha = 0^h 37^m 56^s$  $\delta = +46^\circ 29'$ 

A5

1	6484	1914 Sep	14.799	2420390.799	-88.8	$\pm 2.8$	11	+111.7 $\pm 2.2$	8	D
2	6487		15.729	0391.729	+79.4	1.7	6	-63.4	6	D
3	6500		21.794	0397.794	+129.8	2.2	16	-111.4	10	D
4	6508		27.788	0403.788	+124.7	6.7	7	-128.6	3.5	D
5	6513		28.767	0404.767	-113.5	7.5	9	+123.1	11	D
6	6522	Oct	1.797	0407.797	+123.8	1.8	8	-116.5	10.1	D
7	6533		11.776	0417.776	+104.9	1.0	7	-102.5	2.1	D
8	6537		19.733	0425.733	+85.1	2.9	8	-65.8	4.6	D
9	6542		20.745	0426.745	-30.5	1.3	3	+85.5	4.8	D
10	6546		22.728	0428.728	-11.5	2.4	6			D
11	6555	Nov	2.687	0439.687	+10.2	1.6	18			D clearly single
12	6558		3.608	0440.608	+12.8	1.4	17			D single & narrow
13	6563		6.683	0443.683	-1.0	2.3	9			D
14	6567		9.663	0446.663	+55.4	2.7	4	-42.9	3.5	D
15	6572		13.644	0450.644	+90.9	3.6	10	-71.5	3.2	D
16	6579		23.631	0460.631	+120.6	3.2	11	-101.0	4.2	D
17	6584		27.653	0464.653	+133.6	2.2	16	-117.1	4.0	D

18	6589	Dec 15.626	0482.626 + 82.4	2 (-179.6)	1	D	both 1 line only
19	6592	17.566	0484.566 +106.0	+3.0 10 - 89.7 2.7	9	D	
20	6596	22.575	0489.575 - 58.0	1.6 5 + 84.0 4.3	3	D	
21	6599	27.568	0494.568 + 17.3	4.3 8 - 50.0	1	D	sec. 1 line only
22	6609	1915 Jan 7.547	0505.547 + 0.3	3.1 9		D	
23	6845	Oct 22.690	0793.690 -111.2	2.8 20 +126.4 2.4	19	D	
24	6864	Nov 9.656	0811.656 - 76.6	3.4 16 + 97.2 3.8	10	D	

These velocities, when plotted, show an excellent fit to the orbit of Mannino and Grubisich (Mem. Soc. A. Ital., 27, 65, 1955);  $P = 1.964180$ ,  $e = 0.000$ ,  $T_0 = 2427535.740$  JD,  $K_1 = 120.46$  km/sec.,  $\gamma = +12.86$  km/sec.

7	HD 4727						$\alpha = 0^h 44^m 18^s$	$\delta = +40^\circ 32'$	B5V
1	6797	1915 Sep 1.833	2420742.833 +18.6	+3.3 19		J			
2	6804	8.820	0749.820 -31.7	1.6 22		J			
3	6820	28.799	0769.799 -89.4	3.1 23 +254.3 7.5	3	J	sec. 1 line only		
4	6831	Oct 12.733	0783.733 -68.5	1.7 20 +231.2	1	J	sec. 1 line only		
5	6836	19.728	0790.728 -28.9	2.1 20		J			
6	6851	26.711	0797.711 +25.2	2.9 14 -137.1	1	J	sec. 1 line only		
7	6871	Nov 22.606	0824.606 - 9.1	2.2 23		J			
8	6874	26.546	0828.546 +13.5	2.7 14		J			
9	6884	Dec 15.553	0847.553 -106.6	2.6 20 +111.7 0.5	3	J			
10	6889	21.590	0853.590 +50.6	4.7 19 -116.4	1	J	comparison lines distorted one side		
11	6894	22.513	0854.513 -14.1	2.2 22		J	comparison lines distorted one side		

12 6934 1916 Jan 24.533 0887.533 + 13.6 -8.7 7 J weak

These observations when plotted against the orbit of Jordan (Publ. A.O. 1, 191, 1910) ( $T_0 = 2418155.661$ ) show a reasonable fit despite considerable scatter.

11	HD 12303	4 Persei	$\alpha = 1^h 55^m 38^s$	$\delta = +54^\circ 00'$	88V
1	3072	1909 Oct 6.683	2418586.683 + 0.1	-2.3	10 A,D mean of 2
2	3083	7.737	8587.737 - 0.2	4.0	9 A,D spark very poor mean of 2
3	3092	8.678	8588.678 + 2.3	2.2	11 A,D spark very poor mean of 3
4	3103	9.714	8589.714 + 3.8	2.2	8 A,D mean of 2
5	3114	12.708	8592.708 +25.3	3.4	11 A,D mean of 2
6	3123	14.672	8594.672 + 5.9	2.4	12 A,D, Schl mean of 3
7	3138	19.678	8599.678 + 3.5	3.1	8 A,D over exposed mean of 3
8	3147	30.781	8610.781 +14.4	3.7	9 A,D, Schl mean of 4
9	3164	Nov 2.651	8613.651 - 7.6	1.9	8 A,D spark poor mean of 2
10	3173	3.703	8614.703 +7.7	1.2	10 A,D mean of 3
11	3185	4.718	8615.718 -11.8	2.4	11 A,D, Schl mean of 3
12	3194	6.658	8617.658 - 5.0	3.0	10 A,D mean of 2
13	3205	10.667	8621.667 -10.8	2.8	9 A,D, Schl mean of 3
14	3214	11.717	8622.717 + 1.2	5.3	6 A,D mean of 2
15	3221	13.660	8624.660 - 9.7	2.7	7 A,D mean of 2
16	3229	14.651	8625.651 + 7.6	5.3	7 A,D mean of 2

17	3239	19.617	8630.617	-10.3	3.2	7	A,D	mean of 2
18	3245	23.576	8634.576	-13.2	2.4	9	A,D	mean of 2
19	3254	24.548	8635.548	-17.5	1.8	7	A,D	mean of 2
20	3261	25.639	8636.639	-14.6	2.1	11	A,D	mean of 2
21	3273	26.578	8637.578	-13.0	0.5	6	A,D	mean of 2
22	3277	29.590	8640.590	-24.3	1.7	12	A,D	mean of 3
23	3233	30.551	8641.551	-23.8	2.8	9	A,D	mean of 2
24	3290	Dec 1.556	8642.556	-30.5	2.7	9	A,D	mean of 2
25	3308	2.554	8643.554	-24.0	2.0	10	A,D	mean of 2
26	3318	19.569	8660.569	-18.5	2.6	7	A,D	seed 27 mean of 2
27	3329	20.582	8661.582	-5.2	1.8	9	A,D	seed 27 mean of 3
28	3334	24.481	8665.481	-13.0	1.6	8	A,D	mean of 3
29	3338	1910 Jan 9.583	8681.583	+1.5	3.6	6	A,D	mean of 2
30	3345	10.553	8682.553	+7.1	1.5	8	A,D	mean of 2
31	3359	16.510	8688.510	-8.0	3.9	9	A,D	mean of 2
32	3363	19.564	8691.564	-15.5	1.3	9	A,D	mean of 2
33	3376	Feb 1.524	8704.524	-7.5	2.5	12	A,D	mean of 2
34	3388	4.543	8707.543	+6.9	2.7	10	A,D	mean of 2
35	3393	7.530	8710.530	-6.6	3.5	7	A,D	mean of 2
36	3400	10.561	8713.561	+12.6	5.0	6	A,D	mean of 2
37	3411	19.511	8722.511	+2.3	6.3	5	A,D	mean of 2
38	3414	24.542	8727.542	-2.0	3.4	5	A,D	underexposed mean of 2
39	3812	Sep 15.826	8930.826	+9.7	1.9	10	A,D	mean of 3

40	3825	21.845	8936.845	- 7.4	+4.3	7	A,D	mean of 2 underexposed mean of 2
41	3847	28.847	8943.847	-17.7	3.6	7	A,D	mean of 2 underexposed mean of 2
42	3855	29.837	8944.837	- 4.0	5.0	3	A,D	mean of 2 underexposed mean of 2
43	3881	Oct 7.837	8952.837	+ 4.4	1.8	12	A,D	mean of 2 underexposed mean of 2
44	3887	8.753	8953.753	- 9.5	3.1	8	A,D	mean of 2 underexposed mean of 2
45	3898	10.764	8955.764	- 3.9	2.4	9	A,D	mean of 2 underexposed mean of 2
46	3908	11.783	8956.783	+12.7	3.4	8	A,D	mean of 2 underexposed mean of 2
47	3934	14.771	8959.771	-10.0	2.0	7	A,D	mean of 2 underexposed mean of 2
48	3953	18.727	8963.727	+ 3.1	3.7	7	A,D	mean of 2 underexposed mean of 2
49	3959	19.760	8964.760	- 3.8	3.1	8	A,D	mean of 2 underexposed mean of 2
50	3977	23.741	8968.741	+ 6.3	3.2	5	A,D	mean of 2 underexposed mean of 2
51	4006	31.665	8976.665	- 6.7	2.0	9	A,D	mean of 2 underexposed mean of 2
52	4024	Nov 8.696	8984.696	-24.1	2.8	9	A,D	mean of 2 underexposed mean of 2
53	4031	19.700	8995.700	-18.3	1.7	6	A,D	mean of 2 underexposed mean of 2
54	4043	20.701	8996.701	-16.5	1.9	6	A,D	mean of 2 underexposed mean of 2
55	4055	26.653	9002.653	-24.6	3.4	10	A,D	mean of 2 underexposed mean of 2
56	4070	Dec 8.631	9014.631	- 2.9	4.4	8	A,D	mean of 2 underexposed mean of 2
57	4081	13.649	9019.649	+ 6.8	3.1	5	A,D	mean of 2 underexposed mean of 2
58	4088	14.587	9020.587	-10.8	4.2	9	A,D	mean of 2 underexposed mean of 2
59	4106	17.547	9023.547	-14.3	3.2	11	A,D	mean of 2 underexposed mean of 2
60	4125	27.526	9033.526	+11.2	2.5	9	A,D	mean of 2 underexposed mean of 2
61	4139	1911 Jan 9.536	9046.536	- 4.3	2.6	6	A,D	mean of 2 underexposed mean of 2
62	4144	23.503	9060.503	+ 3.2	1.4	10	A,D	mean of 2 underexposed mean of 2

63	4740	Aug 31.819	9280.819	+ 3.3	4.8	10	D
64	4764	Sep 4.760	9284.760	+ 4.8	4.5	8	D
65	4781	12.757	9292.757	-13.6	4.2	6	D
66	4789	13.737	9293.737	+ 6.3	3.8	7	D
67	4795	17.798	9297.798	- 9.3	3.3	8	D
68	4805	19.713	9299.713	+ 7.7	4.8	10	D
69	4821	24.731	9304.731	+ 8.9	3.5	7	D
70	4827	26.744	9306.744	+11.4	7.8	7	D
71	4837	Oct 2.733	9312.733	+10.7	3.9	10	D
72	4846	8.721	9318.721	- 3.4	4.0	10	D
73	4851	12.720	9322.720	-19.3	4.5	5	D
74	4859	15.697	9325.697	- 6.5	2.1	10	D
75	4869	18.683	9328.683	-10.9	3.9	11	D
76	4885	23.676	9333.676	-33.2	3.6	8	D
77	4896	26.631	9336.631	-10.6	8.3	7	D
78	4906	28.676	9338.676	-28.0	4.8	7	D
79	4924	Nov 5.599	9346.599	-27.0	4.3	6	D
80	4926	8.749	9349.749	-21.7	2.5	12	D seed 23
81	4931	10.669	9351.669	-23.4	4.9	14	D seed 23
82	4938	13.725	9354.725	- 5.5	5.8	4	D
83	4943	16.653	9357.653	- 6.4	3.7	10	D seed 23
84	4948	19.627	9360.627	-14.6	2.8	9	D
85	4953	21.733	9362.733	- 9.4	2.3	9	D

86	4961	26.650	9367.650	-18.9	+4.0	8	D
87	4966	30.650	9371.650	+7.6	5.1	8	D
88	4972	Dec 5.620	9376.620	-11.0	2.2	10	D
89	4987	7.580	9378.580	-13.4	2.4	9	D
90	4993	19.667	9390.667	+0.4	2.3	9	D
91	5000	28.629	9399.629	-1.5	4.8	7	D
92	5009	1912 Jan 1.556	9403.556	+0.9	3.9	8	D
93	5016	7.578	9409.578	-10.4	5.1	8	D
94	5028	21.515	9423.515	+8.3	1.9	4	underexposed
95	5034	31.529	9433.529	-1.8	1.0	9	D
96	5040	Feb. 4.522	9437.522	-5.0	3.8	11	D
97	5041	5.522	9438.522	-3.0	4.7	9	D
98	5052	10.504	9443.504	-9.4	6.3	7	D
99	5065	14.575	9447.575	-8.4	2.9	10	D
100	5544	Nov 3.612	9710.612	-12.1	1.8	10	D

A time plot of these as well as the published velocities from Ottawa, Harper (Publ. D.O. 4, 317, 1919) show a puzzling decrease in velocity of about 25 km/sec. each fall. We suspect that this may well be a beat phenomena resulting from a ultra-short period. Further observations of this star are desirable.

HD 13041			58 Andromedae	$\alpha = 2^h 02^m 27^s$	$\delta = +37^\circ 23'$	A5V	
1	3186	1909 Nov 4.747	2418615.747	- 6.6	+6.4	3.5	D
2	4783	1911 Sep 12.829	9292.829	- 2.2	3.2	5	D
3	5042	1912 Feb 5.566	9438.566	+21.8	2.9	3.5	D

4	5066	14.555	9447.555	+ 5.5	±6.7	1.5	D
5	5991	1913 Sep	6.816	2420017.816	+22.3	3.2	7

Spectroscopic Binary. Double Lines. No Orbit (Plaskett JRASC 13, 60, 1919; Harper Publ. DAO Z. 1, 1937)

13	HD 13869	7 Trianguli	$\alpha = 2^h 10^m 01^s$	$\delta = +32^\circ 54'$	89.5V			
1	3291	1909 Dec	1.575	2418642.575	+18.2	$\pm 2.4$	5	D
2	4847	1911 Oct	8.766	9318.766	- 1.1	1.7	5	D
3	5056	1912 Feb	12.538	9445.538	<u>+ 3.8</u>	0.8	2.5	D
Mean + 7.6								

14	HD 14951		$\xi$ Arietis		$\alpha = 2^h 19^m 27^s$	
1	3231	1909 Nov	14.717	2418625.717	-42.7	$\pm 15.4$ 6.5
2	5007	1911 Dec	31.574	9402.574	-29.6	5.5 7
3	5640	1913 Feb	2.549	9801.549	-33.3	1
4	5642		6.526	9805.526	+26.9	1.7 6
5	6054	Oct	15.765	2420056.765	- 4.3	2.8 6
6	6081	Nov	14.613	0086.613	-45.8	6.1 2
7	6105		23.681	0095.681	+12.9	9.0 5
8	6109	Dec	3.605	0105.605	+33.5	11.4 7
9	6111		4.674	0106.674	- 1.0	6.2 11
10	6113		5.591	0107.591	+14.8	12.7 3
11	6119		11.622	0113.622	-13.6	11.7 5

12	6138	15.662	0117.662	+11.2	$\pm 10.8$	2	J	weak
13	6145	19.649	0121.649	+ 8.8	15.8	3	J	
14	6549	1914 Oct 25.751	0431.751	-24.8	7.4	6	J	broad lines
15	6551	30.750	0436.750	-16.3	7.6	7	J	narrow lines
16	6560	Nov 3.756	0440.756	-32.2	8.3	10	J	narrow lines
17	6568	9.750	0446.750	+24.8	5.0	3	J	broad lines
18	6574	17.629	0454.629	+17.4	8.5	9	J	
19	6558	1915 Nov 4.744	0806.744	+21.9	6.9	3	J	
20	6885	Dec 15.620	0847.620	+14.5		1	J	1 line only; weak
21	6909	1916 Jan 2.629	0865.629	-23.9	4.3	9	J	comparison weak
Mean - 5.8								

The spectrum is definitely double, but at 40 Å/mm dispersion the doubling is not resolved. The appearance of the lines on the plates vary from narrow on some plates to very broad on others. These velocities represent settings without regard to any doubling and individually are of little value. The plates need to be remeasured on an oscilloscope line profile machine.

15	HD 16908	35 Arletts	$\alpha = 2^h 37^m 35^s$	$\delta = +27^\circ 17'$	B3V
1	3126	1909 Oct 14.769	2418594.769	+11.6	J
2	3216	Nov 11.770	8622.770	+ 7.6	J
3	3240	19.656	8630.656	+23.0	J
4	4828	1911 Sep 26.793	9306.793	+ 4.4	J
5	5480	1912 Oct 1.771	9677.771	+16.0	J
6	5552	Nov 8.677	9715.677	+33.6	J
				$\pm 4.4$	comparison weak
				3.5	
				4.1	
				4.0	
				3.7	
				6.3	
				12	
				10	
				8	
				9	
				9	
				7	

The range of these observations agree with a range of +1 to +35 in the published observations. This star should be regarded as a possible spectroscopic binary with a period of the order of 1 day.

16	HD 19356		$\alpha = 3^h 1^m 40^s$		$\delta = +40^\circ 34'$	B8V	
1	991	1907 Nov	15.692	2417895.692	-26.8	$\pm 1.2$ 9	S
2	992		15.711	7895.711	-25.7	1.8 11	S
3	993		15.721	7895.721	-28.2	1.9 12	S
4	994		15.741	7895.741	-20.0	1.3 12	S
5	1011		24.646	7904.646	+ 3.0	2.6 12	S
6	1012		24.661	7904.661	+ 6.8	2.4 8	S
7	1013		24.669	7904.669	+ 2.4	1.3 8	S
8	1028	Dec	4.629	7914.629	-22.7	1.7 10	S
9	1036		7.608	7917.608	-24.3	0.6 11	S
10	1037		7.622	7917.622	-20.1	2.0 10	S
11	1038		7.643	7917.643	-20.4	2.3 16	S
12	1059	1908 Jan	5.608	7946.608	-46.8	2.2 14	S mean of 2
13	1060		5.640	7946.640	-42.9	2.2 17	S
14	1061		5.653	7946.653	-42.4	2.0 19	S mean of 2
15	1075		10.631	7951.631	+13.8	1.4 14	S
16	1076		10.651	7951.651	+11.2	1.5 14	S
17	1077		10.665	7951.665	+11.3	2.4 11	S
18	1088		16.624	7957.624	-13.1	2.0 7	S
19	1089		16.651	7957.651	-23.9	1.8 13	S

20	1090	16.668	7957.668	-19.8	+2.2	12	S
21	1111	19.592	7960.592	-14.4	1.7	17	S
22	1112	19.613	7960.613	-12.7	1.6	15	S
23	1113	19.622	7960.622	-11.5	2.1	13	S
24	1125	24.552	7965.552	+35.6	1.5	15	S
25	1126	24.571	7965.571	+42.9	1.6	14	S
26	1127	24.580	7965.580	+43.9	1.1	21	S
27	1131	25.535	7966.535	-27.8	1.4	12	S
28	1132	25.558	7966.558	-35.9	1.1	14	S
29	1133	25.568	7966.568	-31.1	0.0	15	S
30	1142	29.636	7970.636	+ 7.0	4.0	9	S
31	1143	29.660	7970.660	+10.2	2.0	8	S
32	1144	29.675	7970.675	+ 9.7	2.6	8	S
33	1149	30.559	7971.559	+35.8	2.2	8	S
34	1150	30.597	7971.597	+32.4	1.3	11	S
35	1151	30.628	7971.628	+28.1	1.2	12	S
36	1155	Feb 2.524	7974.524	+19.6	2.1	11	S
37	1156	2.549	7974.549	+18.9	2.0	9	S
38	1157	2.557	7974.557	+20.3	3.1	16	S
39	1161	4.628	7976.628	+27.5	1.4	15.5	S
40	1162	4.655	7976.655	+31.2	1.5	6	S
41	1168	8.592	7980.592	-25.5	2.5	15	S
42	1169	8.628	7980.628	-22.9	1.7	12	S

poor guiding

Mean of 2

mean of 2

43	1170	8.640	7980.640	-26.1	±2.6	12	S
44	1173	9.532	7981.532	-26.3	3.8	10	S
45	1174	9.553	7981.553	-31.9	2.7	15	S
46	1175	9.565	7981.565	-36.1	3.3	12	S
47	1180	10.526	7982.526	+42.8	0.9	13	S
48	1181	10.542	7982.542	+42.2	1.3	8	S
49	1182	10.567	7982.567	+45.9	1.3	10	S
50	1186	11.518	7983.518	-20.7	1.8	15	S
51	1187	11.539	7983.539	-18.3	2.1	13	S
52	1188	11.557	7983.557	-14.8	0.9	15	S
53	1191	20.499	7992.499	-31.0	1.3	12	S
54	1192	20.513	7992.513	-32.5	2.9	12	S
55	1193	20.523	7992.523	-38.4	1.7	15	S
56	1202	1908 Mch 3.503	8004.503	-33.9	1.8	13	S
57	1203	3.518	8004.518	-28.9	1.2	9	S
58	1204	3.525	8004.525	-28.9	1.8	11	S
59	1210	9.506	8010.506	-13.5	1.9	10	S
60	1211	9.518	8010.518	-9.2	2.8	11	S
61	1212	9.524	8010.524	-6.5	1.6	13	S
62	1224	10.547	8011.547	+37.3	2.6	12	S
63	1225	10.569	8011.569	+40.4	1.2	12	S
64	1226	10.576	8011.576	+37.7	3.1	13	S
65	1236	11.503	8012.503	-26.7	1.7	14	S

oiled machine  
poor guiding

66	1237	11.518	8012.518	-30.5	±1.6	16	S.	much overexposed
67	1238	11.526	8012.526	-24.0	2.1	13	S	mean of 2
68	1252	20.524	8021.524	-41.9	1.7	8	S	
69	1253	20.535	8021.535	-44.5	2.0	10	S	
70	1254	20.545	8021.545	-35.1	2.2	10	S	
71	1261	21.509	8022.509	+37.9	2.1	10	S	
72	1262	21.517	8022.517	+36.3	1.3	8	S	
73	1263	21.532	8022.532	+43.6	1.4	15.5	S	
74	1268	22.535	8023.535	+ 1.2	1.7	5	S	
75	1270	25.508	8026.508	-21.0	2.3	4	S	
76	1271	25.531	8026.531	-18.4	2.0	12	S	
77	1277	27.512	8028.512	+46.5	2.9	8	S.	plate very dirty
78	1278	27.528	8028.528	+31.3	5.5	4	S	
79	1999	Oct 2.743	8217.743	+46.8	1.2	13	S	
80	2000	2.758	8217.758	+49.2	2.8	9	S	
81	2001	2.764	8217.764	+50.5	2.1	9	S	
82	2013	3.719	8218.719	- 9.3	1.2	14	S	doubling at 4471 & 4481??
83	2014	3.732	8218.732	- 5.6	1.1	13	S	strong
84	2015	3.736	8218.736	- 7.4	3.2	11	S	
85	2033	9.764	8224.764	-39.8	4.1	3	S	
86	2034	9.779	8224.779	-39.3	1.3	8	S	
87	2039	11.851	8226.851	+36.5	1.7	11	S	
88	2040	11.866	8226.866	+28.5	1.3	10	S	

89	2041	11.882	8226.882	+31.5	±1.3	13	S
90	2045	12.711	8227.711	-37.4	1.2	13	S
91	2046	12.734	8227.734	-32.1	1.3	15	S
92	2047	12.743	8227.743	-40.2	1.0	12	S
93	2057	13.718	8228.718	+15.4	1.6	13	S
94	2058	13.730	8228.730	+20.9	1.3	11	S
95	2059	13.741	8228.741	+24.7	1.7	13	S
96	2106	28.711	8243.711	+45.7	1.2	14	S
97	2113	Nov 1.679	8247.679	-27.6	2.1	10	S
98	2114	1.701	8247.701	-36.4	1.5	14	S
99	2115	1.716	8247.716	-36.6	2.0	12	S
100	2122	2.725	8248.725	+20.4	2.3	10	S
101	2123	2.738	8248.738	+14.9	1.2	11	S
102	2124	2.751	8248.751	+20.9	1.8	15	S
103	2133	4.763	8250.763	-38.5	3.3	11	S
104	2134	4.782	8250.782	-40.7	4.0	7	S
105	2135	4.799	8250.799	-30.6	2.3	6	S
106	2138	5.626	8251.626	+14.5	1.2	9	S
107	2139	5.646	8251.646	+17.2	1.1	12	S
108	2140	5.662	8251.662	+24.7	1.2	12	S
109	2146	8.747	8254.747	+34.8	0.8	10	S
110	2147	8.780	8254.780	+43.8	1.3	14	S
111	2148	8.794	8254.794	+40.3	2.6	13	S

mean of 2; weak

weak

comparison weak

112	2155	9.656	8255.656	+23.6	+1.6	16	S
113	2156	9.672	8255.672	+26.0	2.0	17	S
114	2157	9.685	8255.685	+27.0	2.5	16	S
115	2166	12.622	8258.622	+20.1	3.0	14	S
116	2167	12.646	8258.646	+14.1	2.2	15	S
117	2168	12.666	8258.666	+ 2.4	2.1	10	S
118	2176	13.646	8259.646	-30.6	2.0	15	S
119	2177	13.662	8259.662	-32.0	1.2	16	S
120	2178	13.675	8259.675	-28.9	1.0	13.5	S
121	2180	15.586	8261.586	-13.6	1.9	12	S
122	2181	15.622	8261.622	-16.2	1.2	15	S
123	2189	16.792	8262.792	-18.9	2.1	11	S
124	2142	18.738	8264.738	-24.0	1.7	14	S
125	2194	18.775	8264.775	-25.8	1.9	9	S
126	2201	20.617	8266.617	+52.5	1.4	14	S
127	2202	20.626	8266.626	+55.1	1.8	23	S
128	2203	20.635	8266.635	+52.0	1.6	14	S
129	2212	25.569	8271.569	+ 8.6	1.6	13	S
130	2213	25.593	8271.593	+11.5	1.3	11	S
131	2214	25.611	8271.611	+11.2	2.3	11	S
132	2217	26.561	8272.561	+46.2	2.3	14	S
133	2218	26.583	8272.583	+45.5	1.0	11	S
134	2219	26.601	8272.601	+44.6	1.3	11	S

mean of 2

comparison weak

135	2256	Dec 27.519	8303.519	+35.6	±2.7	12	S	
136	2257	27.538	8303.538	+32.5	0.9	16	S	
137	2258	27.552	8303.552	+35.8	1.0	16	S	
138	2272	30.644	8306.644	+44.7	1.8	14	S	comparison weak
139	2273	30.661	8306.661	+42.8	1.8	13	S	
140	2274	30.674	8306.674	+43.6	1.5	15	S	
141	2296	1909 Jan 18.543	8325.543	-40.8	2.9	8	S	
142	2297	18.563	8325.563	-44.9	2.9	10	S	
143	2312	Feb 6.549	8344.549	+14.0	2.8	14	S	
144	2343	6.558	8344.558	+12.7	2.2	12	S	
145	2362	18.554	8356.554	-25.9	0.3	3	S	
146	2373	22.499	8360.499	-7.4	3.0	6	S	
147	2374	22.514	8360.514	-0.7	2.6	11	S	
148	2408	Mar 17.534	8383.534	-1.0	2.7	8	S	
149	2892	Sep 1.881	8551.881	-51.5	1.9	14	S,T	mean of 2
150	2893	1.891	8551.891	-49.3	1.9	14	S	
151	2915	7.840	8557.840	-45.7	2.2	13	S,T	mean of 2
152	2916	7.854	8557.854	-48.1	2.8	15	S,T	mean of 2
153	2933	10.845	8560.845	-35.1	2.4	13	S,T	mean of 2
154	2934	10.865	8560.865	-35.2	1.8	12	S,T	mean of 2
155	2945	11.831	8561.831	+38.9	3.6	14	S,T	
156	2946	11.851	8561.851	+42.0	1.4	15	S,T	mean of 2
157	2954	13.808	8563.808	-27.9	2.3	18	S,T	mean of 2

158	2955	13.826	8563.826	-24.3	2.8	14	S,T	Mean of 2
159	3050	Oct 4.719	8584.719	+37.6	1.9	18	S,T	mean of 2
160	3061	5.740	8585.740	-24.4	1.3	8	S,T	mean of 2
161	3084	7.773	8587.773	+34.1	1.0	5	S	
162	3093	8.700	8588.700	-20.4	4.9	7	T	
163	3104	9.736	8589.736	-10.0	2.7	13	S,T	mean of 2
164	3115	12.7	8592.731	+ 2.2	3.5	12	S,T	mean of 2
165	3129	18.751	8598.751	+28.5	2.7	12	S,T	mean of 2
166	3139	19.697	8599.697	+16.7	2.6	15	S,T	mean of 2
167	3148	30.806	8610.806	+41.2	3.2	13	S,T	mean of 2
168	3154	31.689	8611.689	-41.2	3.0	8	S	
169	3165	Nov 2.682	8613.682	+36.6	2.2	6	S	
170	3174	3.747	8614.747	-44.4	1.5	7	S	
171	3187	4.792	8615.792	+ 6.3	1.8	10	S	
172	3196	6.703	8617.703	-47.3	3.5	9	S,T	mean of 2
173	3206	10.706	8621.706	+18.6	1.7	12	S,T	mean of 2
174	3215	11.744	8622.744	+22.0	1.6	4	S,T	mean of 2
175	3230	14.683	8625.683	-10.6	1.3	4	S,T	mean of 2
176	3246	23.610	8634.610	-23.5	1.8	13	S,T	mean of 2
177	3256	24.588	8635.588	-13.8	2.4	11	S,T	mean of 2
178	3262	25.676	8636.676	+38.0	1.8	12	S,T	mean of 2
179	3278	29.685	8640.685	-38.0	3.0	11	S,T	mean of 2
180	3284	30.623	8641.623	+20.0	2.8	13	S,T	mean of 2

181	3292	Dec	1.588	8642.588	+24.0	+2.2	12	S,T	mean of 2
182	3309		2.574	8643.574	-15.1	1.9	15	S,T	mean of 2
183	3319		19.594	8660.594	-44.1	4.0	7	S,T	mean of 2
184	3320		19.606	8660.606	-41.2	2.4	10	S,T	mean of 2
185	3330		20.618	8661.618	+12.8	3.1	9	S,T	mean of 2
186	3346	1910 Jan	10.576	8682.576	+42.5	2.5	14	S,T	mean of 2
187	3347		10.588	8682.588	+43.7	3.6	14	S,T	mean of 2
188	3352		15.509	8687.509	+20.2	4.6	5	S,T	mean of 2
189	3360		16.537	8688.537	+26.8	3.5	10	S,T	mean of 2
190	3361		16.560	8688.560	+12.5	1.5	12	S,T	mean of 2
191	3387	Feb	4.518	8707.518	+15.6	3.4	12	S,T	mean of 2
192	3399		10.501	8713.501	+37.1	3.8	13	S,T	mean of 2
193	3410		18.522	8721.522	- 8.2	5.8	8	S,T	mean of 2
194	3412		19.621	8722.621	+47.0	2.2	5	S,T	mean of 2
195	3997	Oct	30.717	8975.717	-12.2	2.8	14	S,T	mean of 2 - poor
196	4008		31.751	8976.751	-12.2	2.3	5	S	
197	4014	Nov	4.808	8980.808	+45.4	2.1	4	S	
198	4032		19.729	8995.729	-14.6	3.4	9	S	
199	4050		23.724	8999.724	-11.4	2.7	9	S	
200	4056		26.677	9002.677	- 6.0	3.2	7	S	
201	4072	Dec	8.753	9014.753	+40.7	2.1	7	S	
202	4074		12.693	9018.693	-19.5	2.4	8	S	
203	4082		13.679	9019.679	-23.3	1.2	9	S	

204	4090	14.695	9020.695	+37.0	+2.2	15	S
205	4094	15.627	9021.627	-27.3	1.9	12	S
206	4097	16.670	9022.670	-21.3	1.1	9	S
207	4408	17.645	9023.645	+33.0	1.2	9	S
208	4117	21.698	9027.698	-42.3	1.9	8	S
209	4426	27.558	9033.558	-48.2	2.3	12	S
210	4427	30.610	9036.610	-45.8	5.8	7	S
211	4472	1911 Feb 23.518	9091.518	-13.8	0.9	10	S
212	4492	27.494	9095.494	+21.0	1.9	13	S
213	4203	28.542	9096.542	-55.0	5.5	7	S
214	4209	Mar 1.515	9097.515	+11.7	1.8	9	S
215	4211	4.528	9100.528	+16.4	1.7	8	S
216	4782	Sep 12.796	9292.796	+39.1	1.8	12	S
217	4791	13.846	9293.846	-26.6	2.9	15	S
218	4796	17.833	9297.833	-20.5	1.9	8	S
219	4807	19.826	9299.826	-32.4	2.3	13	S
220	4812	20.822	9300.822	-14.3	1.4	6	S
221	4829	26.822	9306.822	+16.1	1.3	10	S
222	4839	Oct 2.857	9312.857	+34.3	1.9	9	S
223	4848	8.797	9318.797	+40.6	2.4	10	S
224	4861	15.817	9325.817	-42.0	1.8	9	S
225	4871	18.803	9328.803	-44.0	2.4	10	S
226	4877	19.795	9329.795	+24.2	1.8	9	S

Mean of 2

overexposed

underexposed

comparison weak  
on one side

strong

dust line  
across star

227	4891	25.788	9335.788	+36.3	$\pm 3.2$	7	S
228	4898	26.779	9336.779	- 7.3	1.1	6	S
229	5030	1912 Jan 27.588	9429.588	-31.1	1.1	6	S
230	5035	31.567	9433.567	+50.4	0.7	10	S
231	5038	Feb 2.636	9435.636	- 6.3	3.4	8	S
232	5043	5.590	9438.590	+13.5	2.0	10	S
233	5051	9.617	9442.617	+35.1	1.0	7	S
234	5053	10.543	9443.543	-41.8	2.1	11	S
235	5057	12.569	9445.569	+29.0	1.8	10	S
236	5061	13.482	9446.482	-39.2	1.8	6	S
237	5067	14.581	9447.581	+43.3	1.9	11	S
238	5073	15.572	9448.572	+ 8.6	3.6	9	S
239	5081	17.474	9450.474	+46.6	3.1	13	S
240	5090	23.500	9456.500	+47.6	2.4	12	S
241	5106	Mar 13.530	9475.530	-21.8	1.5	11	S
242	5112	16.509	9478.509	-12.1	4.5	6	S
243	5119	17.543	9479.543	+42.2	5.9	5	S
244	5123	18.514	9480.514	-22.6	2.6	11	S

17 HD 23302

17 Tauri

 $\alpha = 3^h 38^m 56^s$  $\delta = +23^\circ 48'$ 

B6111

1

1067 1907 Jan

6.684

2417582.684

- 1.5

 $\pm 3.8$ 

8

T

2	3015	1909 Sep	24.808	8574.808	+20.2	$\pm 3.6$	7	T	
3	3063	Oct	5.782	8585.782	+14.7	3.4	2	T	poor plate; dust line
4	3074		6.743	8586.743	+8.2	6.4	4	T	
Mean + 5.1									

The range observed here is consistent with the range of +33 to -4 in the published observations. This star warrants further investigation.

HD 23324 18 Tauri  $\alpha = 3^h 39^m 12^s$   $\delta = +24^\circ 32''$  B8V

1 1103 1908 Jan 18.688 2417959.688 +35.1  $\pm 13.8$  1 T

HD 23338 19 Tauri  $\alpha = 3^h 39^m 15^s$   $\delta = +24^\circ 9''$  B6V

1 1062 1908 Jan 5.692 2417946.692 +20.0  $\pm 6.9$  6 T

2 3065 1909 Oct 5.842 8585.842 - 1.7 5.3 5 T dust line

3 3095 8.753 8588.753 + 0.3 4.5 6 T

4 3116 12.760 8592.760 (+40.1) 4.8 3 T underexposed; two lines. spot on one of the lines.

Mean + 6.7

HD 23630  $\eta$  Tauri  $\alpha = 3^h 41^m 32^s$   $\delta = +23^\circ 48''$  B7III

1 1068 1907 Jan 5.733 2147581.733 + 1.8  $\pm 2.0$  2 T

2 2965 1909 Sep 14.849 8564.849 +20.5 4.5 3 T weak

3 2966 14.859 8564.859 +40.8 4.7 2 T very weak

4 2973 16.811 8566.811 - 2.1 4.0 8 T mean of 3



12	5645	Feb	7.528	9806.528	+13.1	+2.3	8		D
13	5694	1914 Dec	15.716	2420482.716	-13.8	3.3	6		D
14	5690		17.712	0484.712	+ 6.3		2		D 1 line only
15	6605	1915 Jan	4.676	0502.676	+19.7	5.5	6		D
16	6610		7.642	0505.642	-11.4	4.6	6		D
17	6615		15.615	0513.615	- 9.7	2.9	7		D
18	6619		25.638	0523.638	+21.3	2.6	6		D
19	6622		28.575	0526.575	-34.8	7.6	7		D
20	6629	Feb	4.522	0533.522	-21.5	3.4	5		D
21	6634		17.561	0546.561	+15.6	2.4	10		D

The range of about +20 to -50 km/sec. observed here agrees with the range of the published observations. The star is a spectroscopic binary with a short period.

31

HD 23850		27 Tauri		$\alpha = 3^h 43^m 13^s$	$\delta = +23^\circ 45'$	B61Vnm	
1	1066	1907 Jan	6.618	2417582.618	- 4.9	+4.6 4	T mean of 2
2	2974	1909 Sep	16.834	8566.834	+37.3	3.6 5	T mean of 2
3	2975		16.860	8566.860	+12.8	4.3 7	T mean of 2
4	2992		18.770	8568.770	+ 6.4	4.1 4	T mean of 2
5	3286	Nov	30.656	8641.656	+12.7	2.4 6	T mean of 2
6	3294	Dec	1.640	8642.640	+ 7.7	3.0 4	T mean of 2
7	3312		2.641	8643.641	- 2.0	1.5 3	T
8	3315		18.747	8659.747	+ 0.9	15.9 2	T
				Mean	+11.0		

Further observations will be necessary to either confirm or reject the existence of a variation in velocity for this star.

3 HD 23862 28 Tauri  $\alpha = 3^h 43^m 14^s$   $\delta = +23^\circ 50'$  B8p

1 1072 1908 Jan 9.681 2417950.681 -32.3  $\pm 12.7$  1.5 T

Based on 2 lines one of which is fair only ( $H_\delta - 41$ : wt. 2,  $H_\gamma - 19$ , wt. 1).

4	HD 24760	$\epsilon$ Persei	$\alpha = 3^h 51^m 8^s$	$\delta = +39^\circ 43'$	B0.5V
1	995	1907 Nov 15.760	2417895.760	+1.0 $\pm 1.9$ 12	D broken plate mean of 2
2	996	15.797	7895.797	+13.2 3.0 10	D
3	1003	16.801	7896.801	+23.3 2.5 12	D
4	1004	16.836	7896.836	+11.2 3.1 10	D
5	1034	Dec 6.743	7916.743	-11.2 1.8 13	D
6	3247	1909 Nov 23.631	8634.631	-8.7 2.2 9	D
7	3257	24.619	8635.619	+1.0 4.1 9	D
8	3263	25.692	8636.692	+3.8 2.2 9	D
9	3274	26.611	8637.611	+10.2 4.4 10	D
10	3279	29.706	8640.706	+5.7 2.2 10	D,A A also meas. as double pri-40.6, sec +81.2
11	3285	30.635	8641.635	+13.6 2.0 11	D,A mean of 2
12	3293	Dec 1.615	8642.615	+18.5 2.5 9	D
13	3310	2.586	8643.586	+13.8 1.8 11	D,A mean of 2
14	3321	19.621	8660.621	-13.0 2.1 10	D,A mean of 2
15	3331	20.638	8661.638	-27.3 2.5 18	D mean of 2

16	3348	1910 Jan 10.609	8682.609	+11.6	* 0.9	11		D
17	3355	15.606	8687.606	- 9.4	3.0	9	-42.5	1 D
18	3365	19.608	8691.608	+10.5	2.4	10		D
19	3389	Feb 4.562	8707.562	-12.0	3.9	10	- 9.3	1 D
20	3394	7.569	8710.569	+ 0.5	1.8	10	- 2.7	0.5 D
21	3409	18.540	8721.540	+ 0.2	5.3	7		D
22	3900	Oct 10.815	8955.815	+ 7.1	4.8	7	+34.1	0.5 D
23	3919	12.833	8957.833	-15.5	2.9	11	+ 2.5	0.5 D
24	3955	18.819	8963.819	+13.6	3.1	11		D
25	3961	19.836	8964.836	+ 8.3	4.8	10		D
26	3968	20.719	8965.719	+19.0	4.4	10	+25.6	1 D
27	3998	30.740	8975.740	+13.2	3.5	9		D
28	4015	Nov 4.836	8980.836	+12.3	1.8	8	+13.0	1 D
29	4033	19.753	8995.753	+24.2	4.1	6	+ 7.0	1 D
30	4059	26.750	9002.750	+13.9	2.4	8	+12.5	1 D
31	4083	Dec 13.699	9019.699	+15.5	3.9	8	+ 6.2	1 D
32	4095	15.644	9021.644	+28.9	2.5	16	- 9.7	1.5 D
33	4098	15.693	9022.693	+17.5	2.7	11	+ 9.8	1 D
34	4109	17.665	9023.665	- 1.0	2.6	11	- 9.6	1 D
35	4118	21.723	9027.723	- 2.0	1.8	11		D
36	4128	30.638	9036.638	+ 1.7	4.1	8	+13.6	1 D
37	4146	1911 Jan 23.590	9060.590	+ 8.3	2.7	10	+47.3	0.5 D
38	4152	24.496	9061.496	+ 9.4	2.9	10	- 1.7	0.5 D

mean of 2

39	4156	24.685	9061.685	+23.0	± 2.0	12			D
40	4160	28.497	9065.497	+ 3.3	3.5	11	-17.7	0.5	D
41	4162	30.486	9067.486	- 5.1	3.9	11	-25.1	0.5	D
42	4165	Feb 1.667	9069.667	-17.8	4.5	3	+10.2	0.5	D
43	4166	9.481	9077.481	+ 6.8	1.9	11	+ 5.2	1	D
44	4173	23.542	9091.542	+14.4	1.7	7	+10.2	0.5	D
45	4181	24.539	9092.539	+17.7	2.9	9	- 3.8	1	D
46	4193	27.517	9095.517	-15.5	5.1	8	- 7.8	1	D
47	4204	28.564	9096.564	- 6.6	3.3	10	-28.8	0.5	D
48	4210	Mar 1.537	9097.537	-19.4	4.0	11			D
49	4212	4.552	9100.552	+ 1.5	3.9	10			D
50	4218	6.496	9102.496	+ 3.8	1.7	13	- 0.3	1	D
51	4227	10.494	9106.494	+11.3	3.2	10	+ 3.1	1	D
52	4236	13.499	9109.499	-14.7	1.6	13	+ 0.5	0.5	D
53	4258	21.519	9117.519	+ 9.9	2.9	10	+ 0.9	1	D
54	4892	1911 Oct 25.812	9335.812	- 6.8	2.6	13	- 0.4	1	D
55	4899	26.808	9336.808	+ 3.6	1.9	11			D
56	4913	29.730	9339.730	+ 5.1	11.7	12			D
57	4933	Nov 10.809	9351.809	-11.3	1.8	13			D
58	4944	16.724	9357.724	+16.0	2.9	9			D
59	4964	26.816	9367.819	+ 2.4	3.0	11	+25.4	1	D
60	4975	Dec 5.780	9376.780	-15.2	2.6	12			D
61	4980	6.681	9377.681	-15.6	2.4	12	-13.2	1	D

62	4990	13.722	9384.722	- 2.6	± 1.8	13			D
63	4994	19.704	9390.704	-12.1	2.8	14	+23.4	0.5	
64	5001	28.673	9399.673	+ 7.6	1.8	12			D
65	5008	31.637	9402.637	+30.0	3.0	11	-18.7	1	D
66	5017	1912 Jan 7.628	9409.628	+ 6.1	2.0	11	- 8.5	1	D
			Mean + 3.3				Mean I.S. + 2.2		

Despite the quantity of material here presented, it is still difficult to make any definitive statement as to the nature of this star. Frost and Adams (Ap. J. 19, 152, 1904) note that there are differences in the appearance of the same lines on different plates which has been attributed to line doubling by others. These differences in appearance of certain lines is apparent on a number of Allegheny plates. A notable example is  $\lambda 4026$ . On plate 3321 the appearance is asymmetric with the profile stopping gradually on the violet side and rising abruptly on the red side. On plate 3389, the profile shows a pronounced core on the violet side with no abrupt rise on the red side. The work of Henroteau indicates that the star may have a rapid velocity fluctuation. More investigation in this direction is needed.

5 52 53 HD 25204  $\lambda$  Tauri  $\alpha = 3^h 55^m 8^s$   $\delta = +12^\circ 12'$  B3V

Ebbighausen and Struve (Ap. J. 124, 507, 1956) have remeasured all the Allegheny plates of this star using modern wavelengths. A total of 133 radial velocities are given including 7 plates previously unpublished.

6 HD 27309 56 Tauri  $\alpha = 4^h 13^m 41^s$   $\delta = +21^\circ 32'$  Asf

1	2207	1908 Nov 20.794	2418266.794	+10.0	± 1.5	13	J
2	2407	1909 Mar 15.545	8381.545	+ 1.9	1.7	15	J
			Mean + 5.7				

Four plates were grouped in the plate file under the heading 51 Tau. The Keeler Reflector did not have a

large field finder in those days and some confusion evidently resulted between 51 Tau and the near by star 56 Tau. Inspection of the plates revealed that the two listed above were actually the Asi star 56 Tau. These had been measured and published by Jordan under the heading of "51 Tau" (Publ. A.O. 1, 113, 1909 - note error in plate number). They are republished here as a correction and revision.

27 HD 27176 51 Tauri  $\alpha = 4^h 12^m 28^s$   $\delta = +21^\circ 20'$  dA8 not measured

1 2220 1908 Nov 26.639 2418272.639  
2 2409 1909 Mar 20.542 8386.542 +33.0  $\pm$  4.6 9 J

See discussion for 56 Tauri.

28 HD 30614  $\alpha$  Camelopardi  $\alpha = 4^h 44^m 6^s$   $\delta = +66^\circ 10'$  09.51a

1	3332	1909 Dec 20.677	2418661.677	+ 6.0 $\pm$ 1.9	8	-12.2	8	J	mean of 2 comp. weak
2	3356	1910 Jan 15.639	8687.639	+21.8	4	-1.2	6	J	
3	3970	Oct 20.766	8965.766	+23.9	3	-10.3	3	J	Lumiere $\Sigma$
4	4000	30.803	8975.803	+14.0	5	-10.5	5	J	
5	4061	Nov 26.788	9002.788	+23.6	6	-4.1	5	J	
6	4091	Dec 14.726	9020.726	- 7.3	5	-13.2	4	J	
7	4110	17.692	9023.692	+25.2	6	-2.0	5	J	
8	4129	30.669	9036.669	- 1.9	7	-10.6	5	J	comp. weak
9	4137	1911 Jan 5.590	9042.590	+28.4	4	-3.8	3	J	
10	4141	9.651	9046.651	+12.9	6	+4.8	5	J	
11	4147	23.623	9060.623	- 0.3	6	+1.7	5	J	overexposed seed 23
12	4155	24.653	9061.653	+10.4	6	-4.0	5	J	seed 23
13	4161	28.648	9065.648	+11.8	2			J	1 line only, spectrum and comp. weak

14	4205	Feb 28.596	9096.596	- 1.1	7.5	5	- 2.4	6	J
15	4908	Oct 28.790	9338.790	+10.8	2.2	9	- 6.1	5	J seed 23
16	4914	29.766	9339.765	<u>+14.4</u>	2.5	9	- 5.9	6	J seed 23
			Mean	+11.2					
					Mean I.S. - 5.3				

appears to be due to pulsation. These velocities fit Plaskett's pulsation curve reasonably well with phases computed from  $P = 21.90$  and  $T_0 = \text{JD}2417961.000$ .

HD 35411       $\alpha = 5^h 19^m 27^s$        $\delta = -02^\circ 29'$       B0.5V

$\psi$  Orionis

A total of 44 radial velocities are available from the epochs 1908-09 and 1914-15. The presence of a third body in the system was noted by Beal (P.A.S. 3 117, 1915) from the 1914-15 series. These 44 velocities will be published separately as part of a more extended analysis using recent Allegheny Observatory velocities as well as astrometric residuals.

HD 35715	$\psi$ Orionis	$\alpha = 5^h 21^m 36^s$	$\delta = +3^\circ 1'$	B21V
1 2264 1908 Dec 27.714	2418303.714 +119.0	+3.3 14	-164.0 $\pm 7.0$	7 J
2 3080 1909 Oct 6.876	8586.876 +145.4	2.7 13	-178.5 9.5	9 J
3 3149	30.844			J
4 3200 Nov 6.810	8610.844 -119.3	2.8 7	-1.6	J
5 3218	11.842			J
6 3225	13.850			J
7 3232	14.764			J
8 3249	23.759			J
9 4075	12.747			J
10 4092	14.754			J
11 4130	30.717			J
12 4174 1911 Feb 23.581	9091.581 +17.3	3.1 12	+23.0	J
13 4195	27.577			J
14 4915 Oct 29.812	9339.812 +156.7	3.7 10	-182.9 3.2	5 J

2

15	4982	Dec 6.743	9377.743	+156.6	+3.5	15	-232.4	+8.3	+18.4	6'	J
16	4991	13.767	9384.767	+ 87.3	4.6	8			+36.3		J
17	4995	19.746	9390.746	+ 44.9	3.9	10			+29.9		J
18	5022	1912 Jan 13.635	9415.635	+130.1	5.8	9	-207.3	15.0	+32.4	2	J
19	5025	16.600	9418.600	+ 29.7	3.5	13			-12.7		J
20	5045	Feb 8.526	9441.526	- 12.8	3.3	12			-32.3		J
21	5054	10.580	9443.580	+124.3	4.3	11	-158.0	5.6	+56.0	8	J
22	5083	17.612	9450.612	+129.6	4.8	13	-205.8	8.0	+17.4	4	J
23	5591	Nov 30.700	9737.700	-130.1	2.8	10	+290.6		-13.9	1	J
24	5603	Dec 12.680	9749.680	- 2.6	2.7	11			-11.8		J
25	5612	22.744	9759.744	+ 9.9	1.7	14			- 8.0		J
26	5621	28.652	9765.652	- 94.1	3.2	14	+179.8		-12.2	1	J
27	6065	1913 Nov 2.772	2420074.772	+167.0	4.3	8	-215.5		+14.5	2	J
28	6084	14.755	0086.755	+ 5.0	6.9	9					J spectrum weak
29	6096	20.839	0092.839	+103.8	4.5	12	-145.1	6.3		5	J
30	6129	Dec 12.795	0114.795	+109.4	5.5	10					J
31	6159	1914 Jan 13.680	0146.680	-104.8	5.5	9					J
32	6168	Feb 1.593	0165.593	+154.7	4.3	14	-207.8	4.7		8	J comp. weak
33	6172	2.664	0166.664	- 86.0	2.5	9	+161.8			1	J spectrum weak
34	6552	Oct 30.811	0436.811	- 27.0	3.1	16			-31.4		J
35	6575	Nov 17.721	0454.721	- 98.7	8.5	9	+260.9			1	J spectrum weak

This system is described by Batten (Publ. D A O 13, 196, 1967, No. 173) as having a possible rotation of the line of apsides with a period of 40 or 50 years. A third body is suspected by the authors and observations are

being continued.

HD 36695      VV Orionis       $\alpha = 5^h 28^m 27^s$        $\delta = -1^\circ 14'$       B1V

A total of 17 observations exist for the 1915-16 epoch and for which velocities have been derived. These velocities will be published elsewhere in conjunction with a more extensive analysis employing recent velocities also determined at Allegheny. Daniel (Publ. A. C. 3, 179, 1915) and Struve and Luyten (Ap. J. 110, 160, 1949) suspected the presence of a third body. Observations are being continued.

4	HD 37043		Orionis	$\alpha = 5^h 30^m 32^s$	$\delta = -5^\circ 59'$	09III
1	968	1907 Nov	2417891.829	+25.1	+21.7	1.5 J
2	997		7895.826	+36.8	+39.9	1 J
3	998		7895.873	+30.6	+18.2	2 J
4	3339	1910 Jan	8681.684	+27.0	+20.5	3 J
5	3350		8682.672	+47.9	+24.2	2 J
6	3367		8691.659	+76.2	+22.2	6 J
7	3413	Feb	8722.568	+136.4	+55.4	0.5 J
8	3415		8727.583	-60.7	+31.5	2 J
9	3466	Mar	8756.522	-59.5	+28.0	2 J
						1 line only spectrum weak

These velocities show a reasonable fit to the orbital curve of Plaskett and Harper (Ap. J. 27, 276, 1908).

5	HD 37438		125 Tauri	$\alpha = 5^h 33^m 32^s$	$\delta = +25^\circ 50'$	B2V
1	6184	1914 Feb	2420185.609	+7.8	+3.9	11 D

2	6576	Nov 17.757	0454.757	+ 9.1	+2.5	9	D
3	6580	23.767	0460.767	+ 3.7	4.2	10	D
4	6598	Dec 25.769	0492.769	- 0.4	3.6	10	D
5	6626	1915 Jan 29.641	0527.641	+67.3	4.0	11	D
6	6642	Feb 19.555	0548.555	+ 4.5	4.3	13	D
7	6646	28.587	0557.587	+29.6	6.9	10	D
8	6654	Mar 9.568	0566.568	- 2.6	6.9	8	D
9	6658	12.587	0569.587	+41.3	1.1	21	D, J
10	6859	Nov 4.813	0806.813	+60.8	2.7	19	Graflex plate full of black spots; mean of 2
11	6897	Dec 22.733	0854.733	+ 7.5	5.1	11	D

Graflex plate

D, J Graflex plate full of black spots; mean of 2

These velocities fit well on Cannon's orbit (Publ. D.O. 3, 424, 1916). Plate 6626 was taken very near to the time of periastron passage and is somewhat more positive than Cannon's orbit at that point. This plate shows a suggestion of a secondary spectrum in both  $H_\alpha$  and  $H_\gamma$  as well as  $\lambda 4226$ . The separation is approximately 120 km/sec.

HD 41357	40 Aurigae	$\alpha = 5^h 59^m 41^s$	$\delta = +38^\circ 29'$	Am	
1 6189	1914 Feb 24.645	2420188.645	+21.7	+1.1 26	D
2 6200	27.635	0191.635	+33.5	1.5 25	D
3 6211	Mar 12.630	0204.630	+28.4	1.6 21	D
4 6238	Apr 10.562	0233.562	+28.0	1.2 22	D
5 6240	12.544	0235.544	+24.6	1.5 20	D
6 6244	13.545	0236.545	+25.6	2.2 24	D
7 6602	Dec 31.760	0498.760	+ 4.4	2.1 21	D
8 6617	1915 Jan 15.731	0513.731	+22.3	1.9 18	D

9	6631	Feb	4.674	0533.674	+11.5	±6.0	9		D
10	6639		18.630	0547.630	+25.9	1.5	23		D
11	6650	Mar	1.575	0558.575	+26.7	1.0	22		D

These velocities, when plotted on the orbit of Young (Publ. D.O. 4, 95, 1917) show a reasonable fit. Blending with the secondary spectrum is apparent.

HD 42560		$\xi$ Orionis		$\alpha = 6^h 6^m 15^s$		$\delta = +14^\circ 14'$		83V	
1	2130	1908	Nov	2.938	2418248.938	+26.9	±3.8	6	J
2	2290	1909	Jan	7.768	8314.768	+20.9	6.1	5	J
		Mean		+24.2				Mean I.S. + 8.0	

Three additional spectra remain unmeasured.

HD 47105		$\gamma$ Geminorum		$\alpha = 6^h 31^m 56^s$		$\delta = +16^\circ 29'$		A01V	
1	333	1907	Mar	11.598	2417646.598	- 8.3	±1.9	15	B seed 27
2	357			23.631	7658.631	-13.9	1.0	53	B L.S. Excellent
3	365			25.610	7660.610	-12.2	0.9	41	B L.S.
4	378		Apr	2.532	7668.532	-12.2	1.2	35	B L.S.
5	379			2.571	7668.571	-11.0	1.8	27	B L.S.
6	384			3.572	7669.572	-10.5	1.9	38	B L.S.
7	390			20.596	7686.596	- 9.1	1.8	22	B L.S. underexposed
8	395			21.544	7687.544	- 7.0	2.6	22	B L.S.
9	402			24.549	7690.549	-17.6	1.9	21	B L.S. underexposed

These velocities are consistent with the period of 12.4 years. A final orbit combining both spectroscopic and astrometric results is in preparation. A preliminary discussion was presented in Proc. I.A.U. Symp. No. 30, 1967.

HD 47839	15 Monocerotis	$\alpha = 6^h 35^m 28^s$	$\delta = +9^\circ 59'$	07
1 2021 1908 Oct 3.901 2418218.901 +13.4 ±3.4 9			+20.4 4	J mean of 2
2 2289 1909 Jan 7.731 8314.731 +23.1 3.1 9			+26.2 4	J comp. weak mean of 2
3 2300 18.716 8325.716 +7.4 3.0 8			+18.0 3	J mean of 2
4 2308 20.790 8327.790 +31.1 5.0 8.5			+13.6 3	J comparison weak
5 2319 24.714 8331.714 +12.8 2.5 11			+34.4 1	J comparison weak
6 2332 Feb 1.729 8339.729 +9.2 7.2 10			+15.2 2	J
7 2344 6.593 8344.593 +13.9 4.6 9			+16.5 2	J
8 2352 7.716 8345.716 -11.8 6.4 10			+2.7 2	J spark weak
9 2358 11.707 8349.707 +21.1 3.1 11			+9.2 3	J
10 3018 Sep 24.889 8574.889 +20.8 3.1 9			+30.6 1	J
11 3055 Oct 4.884 8584.884 +7.1 6.1 9			+18.8 2	J
12 3066 5.878 8585.878 +8.3 3.9 8			+24.8 1	J comparison weak
13 3098 8.863 8588.863 +1.0 4.4 6.5			+5.7 1	J
14 3119 12.861 8592.861 +18.5 3.9 11			+15.4 2	J
15 3132 18.869 8598.869 +12.2 3.5 6			+9.6 1	J
16 3143 19.838 8599.838 +12.1 3.7 5			+19.5 2	J
17 3158 31.815 8611.815 +35.0 7.9 5				J comparison overexposed
18 3201 Nov 6.854 8617.854 +12.2 6.6 6			+13.2 2	J
19 3219 11.881 8622.881 +7.8 3.6 6			+25.7 2	J

20	3226	13.897	8624.897	+15.4	+4.9	6.5	+32.0	1	J	
21	3252	23.846	8634.846	+ 7.5	6.5	6.5	+22.3	3	J	
22	3266	25.792	8636.792	+37.3	2.7	3	+21.6	3	J	
23	3280	29.774	8640.774	+22.4	2.1	2.5	- 1.0	2	J	comparison weak
24	3316	Dec 18.771	8659.771	+20.2	5.6	7	+55.7	1	J	
25	3326	19.719	8660.719	+ 6.7	4.4	6			J	
26	3342	1910 Jan 9.747	8681.747	+25.6	2.9	6	+27.5	2	J	
27	3371	19.776	8691.776	+20.0	6.6	7	+11.4	2	J	
28	3381	Feb 1.706	8704.706	+23.0	4.1	11	+21.6	3	J	
29	3384	3.729	8706.729	+22.2	7.2	3.5	- 3.4	2	J	
30	3395	7.617	8710.617	+22.9	6.6	5	+ 5.3	2	J	
31	3401	10.618	8713.618	-10.1	5.6	5	+11.1	2	J	
32	3418	Mar 1.565	8732.565	+11.6	5.0	5			J	comparison weak
33	3421	2.675	8733.675	+46.7	0.0	2			J	doubtful spectrum weak
34	3423	3.633	8734.633	+17.2	5.8	9	+29.6	2	J	
35	3431	5.524	8736.524	+12.8	3.4	5	+ 7.4	2	J	
36	3438	10.557	8741.557	+ 7.3	3.2	5	+ 5.3	2	J	
37	3446	15.561	8746.561	+24.3	11.0	8	+13.6	3	J	
38	3461	21.568	8752.568	+15.6	2.7	7	+63.9	2	J	
39	3479	Apr 1.540	8763.540	+36.6	6.3	8	+18.6	4	J	comparison weak
40	3482	2.530	8764.530	+25.9	5.7	7	+38.6	3	J	comparison weak
41	4131	Dec 30.747	9036.747	+29.7	12.7	5	+13.5	2	J	
42	4171	1911 Feb 21.634	9089.634	+26.5	6.1	2.5	+23.1	1	J	

43	4176	23.642	9091.642	+ 0.8	±6.7	6.5	+21.7	2	J	
44	4183	24.601	9092.601	+34.3	7.6	5	+ 8.5	2	J	
45	4214	Mar 4.616	9100.616	-22.8	8.3	1.5	+10.5	2	J	comparison weak
46	4229	10.594	9106.594	+14.8	5.6	11	+11.3	6	J	
47	4238	13.594	9109.594	+25.0	2.2	7	- 0.2	2	J	comparison weak
48	4245	18.586	9114.586	+11.6	7.9	5	+11.2	1	J	
49	4247	19.614	9115.614	+11.5	4.5	6	+16.0	1	J	
50	4249	20.513	9116.513	+29.1	7.0	4	+18.1	2	J	
51	4264	24.517	9120.517	+ 1.5	12.5	7	+14.6	2	J	
52	4272	25.533	9121.533	+28.9	5.4	5	-10.3	2	J	
										Mean I.S. ±17.0

This star might be expected to show a pulsation mode in radial velocity. The large scatter would appear to be evidence of this but no regularity in the velocity variations is apparent.

HD 57103		19 Lyncis A		$\alpha = 7^h 14^m 42^s$		$\delta = +55^\circ 28'$		88		
1	5691	1913 Mar	17.636	2419844.636	+81.6	±3.6	7	-138.3 12.2	4.5	J
2	5695		18.622	45.622	-61.6	6.1	7	+247.9	2	J
3	5700		19.601	46.601	+102.9	10.6	5	-297.7	2	J
4	5705		22.598	49.598	-54.3	4.7	9	-344.9	2	J
5	5709		28.612	55.612	+111.5	0.7	8.5	-181.4 18.8	4	J
6	5714	Apr	1.550	59.550	+15.0	4.0	11			J
7	5720		7.574	65.574	-81.9	5.3	6			J
8	5725		16.553	74.553	-64.3	3.6	6.5	+138.8 19.9	2	J

10	5736	19.566	77.566	+12.5	+10.6	5.5	J	
11	5739	20.555	78.555	+73.4	10.6	3	J	spectrum weak
12	5744	21.557	79.557	-22.6	9.8	2	J	spectrum weak
13	5748	23.553	81.553	-103.5	3.5	1.5	J	spectrum weak
14	5752	24.564	82.564	+121.9	6.6	5	J	spectrum weak
15	6170	1914 Feb 1.726	2420165.726	+ 8.9	4.4	7	J	
16	6194	25.688	0189.688	+49.9	6.1	5	J	
17	6204	Mar 3.661	0195.661	- 4.1	4.2	4	J	second. 1 line only
18	6217	15.641	0207.641	- 6.8	11.0	3.5	J	poor; spectrum weak
19	6248	Apr 17.573	0240.573	-26.7	5.5	4.5	J	poor
20	6607	1915 Jan 4.804	0502.804	.0.6	7.9	2	J	
21	6612	7.747	0505.747	+10.7	6.7	6.5	J	spectrum weak
22	6618	15.799	0513.799	+ 9.0	1.8	2.5	J	very weak
23	6621	25.764	0523.764	+15.6	3.5	2.5	J	poor - weak
24	6633	Feb 16.690	0545.690	-42.0		2	J	1 line - weak
25	6640	18.706	0547.706	-17.5	2.2	9	J	
26	6643	19.642	0548.642	+ 3.0	1.6	9	J	
27	6930	1916 Jan 22.722	0885.722	+29.4	13.5	2	J	weak

These observations fit the orbit of Harper (Publ. D. O. 4, 235, 1918),  $P = 2.25960$ ,  $T_0 = 2419031.632$ ,  $K_1 = 106.4$ .

HD 58343

$\alpha = 7^h 20^m 09^s$

$\delta = -16^\circ 00'$

B3Ve

1 2269 1908 Dec 28.756 2418304.756 -15.2  $\pm 4.5$  6 + 0.5 0.5 J

2	3419	1910 Mar	1.615	8732.615	- 0.4	*6.5	6	-17.2	1'	J
3	3433		5.610	8736.610	- 2.8	6.4	10			J
4	3445		15.524	8746.524	-15.3	1.7	13			J
5	5004	1911 Dec	28.799	9400.799	-14.9	5.1	16			J
6	5033	1912 Jan	27.737	9430.737	-42.3	4.0	8			J
7	5093	Feb 23.666		9457.666	- 4.8	3.2	11			J weak
8	5605	Dec 12.790		9750.790	-15.2	1.9	9			J
9	5636	1913 Jan	21.741	9790.741	- 0.4	4.0	8			J weak
10	5651	Feb. 12.656		9812.656	-1.7	2.2	21			J
11	5655		13.649	9813.649	-14.0	1.7	23	- 5.0	0.5	J
12	5664		19.672	9819.672	- 9.3	1.7	3			J faint
13	5674		25.649	9825.649	+ 2.0	1.6	12			J
14	5681	Mar 11.609		9838.609	-11.2	3.8	25			J
15	6185	1914 Feb	21.673	2420186.673	- 7.4	3.2	14			J
16	6627	1915 Jan	29.714	0528.714	-26.9	2.5	2			J very weak
17	6636	Feb 17.690		0547.690	-29.0	4.1	16			J
				Mean	-11.6					
				Mean I.S.	- 9.7					

The range is small (+2 to -42). From the early spectral type and the absence of any pronounced variation in the published velocities we conclude that this star is not a spectroscopic binary.

HD 61497      24 Lyncis       $\alpha = 7^h 34^m 33^s$        $\delta = +58^\circ 57'$       A3III

1	5070	1912 Feb 14.687	2419447.687	+ 3.3	±1.9	3	D
2	5107	Mar 13.568	9475.568	+ 8.9	3.2	3	D
3	5187	Apr 19.572	9512.572	- 1.7	14.2	6	D
4	5676	1913 Mar 5.619	9832.619	+ 4.1	1.7	6	D
Mean + 8.1							

3	HD 63975	$\zeta$ Canis Minoris		$\alpha = 7^h 46^m 31^s$	$\delta = +2^\circ 01'$	B8		
1	2476	1909 Apr	17.553	2418414.553	+18.4	$\pm 5.2$	5	J
2	4983	1911 Dec	6.789	9377.789	+25.4	3.3	9	J
3	5069	1912 Feb	14.635	9447.635	+29.9	3.4	8	J
4	5172	Apr	11.559	9504.559	+30.9	7.0	5	J
5	6603	1914 Dec	31.822	2420498.822	<u>+27.5</u>	4.0	4	J
Mean								+26.6

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4	HD 67006	27 Lyncis		$\alpha = 8^h 0^m 56^s$	$\delta = +51^\circ 48'$	A2V
1	1104	1908 Jan 18.732	2417959.732	+46.0	$\pm 9.5$	4
2	1228	Mar 10.661	8011.661	+12.3	14.0	3
3	1255	20.610	8021.610	+12.4	10.5	4
4	2321	1909 Jan 24.803	8331.803	+28.7	6.7	2
5	2383	Feb. 25.677	8363.677	- 8.0	3.5	5
6	2399	Mar 7.649	8373.649	+18.3	11.0	4
						+31.0 if H <sub>8</sub> is omitted; p <sub>8</sub> = ± 6.0-

The range of +46 to -8 as well as the published range of +30 to -15 indicates a possible spectroscopic binary.

HD 78316

 $\alpha = 9^h 02^m 20^s$  $\delta = +11^\circ 04'$ 

Ap

 $\kappa$  Cancri

1	3383	1910 Feb	1.768	2418704.768	+40.3	2.2	18	J,D
2	3385		3.769	8706.769	-46.2	2.9	9.5	J,D
3	3403		10.740	8713.740	-33.2	2.2	13.5	J,D
4	3407		13.743	8716.743	+64.7	2.2	6	D underexposed
5	3428	Mar	3.725	8734.725	+65.8	2.2	11.5	D
6	4151	1911 Jan	23.817	9060.817	+64.7	3.0	13	J,D
7	4177	Feb	23.692	9091.692	+19.1	2.5	10.5	J,D
8	4196		27.627	9095.627	-2.6	3.5	7	D
9	4221	Mar	6.643	9102.643	-41.6	1.4	13	J,D
10	4230		10.645	9106.645	+73.9	2.8	13	D
11	4239		13.627	9109.627	-59.9	1.9	9	D
12	4284		19.684	9115.684	-57.0	7.3	3	D underexposed
13	6160	1914 Jan	13.746	2420146.746	+28.2	3.3	7	D
14	6171	Feb	1.802	0165.802	+21.4	1.6	16	D
15	6176		8.795	0172.795	+60.4	4.1	6	D underexposed
16	6186		21.732	0185.732	+53.6	3.6	3.5	D underexposed
17	6190		24.737	0188.737	-7.0	2.0	15	D
18	6195		25.774	0189.774	-55.3	3.7	3	D underexposed
19	6201		27.701	0191.701	+40.5	2.2	14	D
20	6207	Mar	11.676	0203.676	-5.4	4.2	4	D underexposed
21	6218		15.729	0207.729	-1.0	4.3	4	D underexposed
22	6222		20.656	0212.656	+71.9	1.5	16	D

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23	6228	27.627	0219.627	+ 4.4	±4.7	4	D	underexposed
24	6232	Apr 3.635	0226.635	+37.7	2.8	6	D	
25	6235	5.638	0228.638	-43.2	3.1	13	D	
26	6239	10.646	0233.646	-15.7	3.1	14	D	
27	6241	12.634	0235.634	+ 3.7	3.0	10	D	
28	6245	13.607	0236.607	+43.8	2.8	14	D	
29	6249	17.653	0240.653	-42.4	4.0	5	D	underexposed
30	6252	21.597	0244.597	+71.4	3.8	8.5	D	underexposed
31	6253	23.525	0246.625	-32.7	5.1	4	D	
32	6254	26.598	0249.598	-27.5		2	D	underexposed
33	6255	27.596	0250.596	-15.6	2.7	3	D	underexposed
34	6257	29.615	0252.615	- 3.9	4.7	7	D	
35	6258	30.585	0253.585	-51.2	2.0	12	D	
36	6628	1915 Jan 29.788	0527.788	- 8.3	8.2	7	D	underexposed
37	6637	Feb 17.783	0546.783	-11.4	3.0	14	D	
38	6641	18.794	0547.794	-46.6	1.3	14	D	
39	6644	19.743	0548.743	-25.6	9.2	5	D	
40	6647	28.688	0557.688	+72.2	3.3	8	D	
41	6651	Mar 1.698	0558.698	+45.9	2.6	15	D	
42	6655	9.725	0566.725	-45.9	2.0	11	D	
43	6663	13.671	0570.671	+77.3	2.8	7	D	
44	6665	16.706	0573.706	-50.4	4.1	13	D	
45	6945	1916 Feb 7.756	0901.756	+59.2	4.0	8	D	

46	6953	14.756	0908.756	+54.8	*6.0	7	D
47	6957	21.254	0915.754	+75.0	1.6	18	D
48	6960	Mar 2.722	0925.722	-12.7	2.2	4	D
49	6964	10.730	0933.730	+53.1	1.9	18	D
50	6967	11.691	0934.691	+80.3	3.2	16	D
51	6970	17.669	0940.669	+69.1	2.7	7	D
52	6973	19.651	0942.651	+24.6	2.3	19	D
53	6977	23.655	0946.655	+62.8	1.9	16	D
54	6979	30.656	0958.656	+64.5	3.8	3	D
55	6982	1916 Apr 14.590	2420958.590	+23.4	2.9	14	D
56	6987	9.625	0963.625	-53.1	2.0	15	D
57	6989	10.583	0964.583	- 2.8	1.8	13	D
58	6992	11.597	0965.597	+50.5	4.3	10	D
59	6994	15.567	0969.567	-56.0	1.5	24	D
60	6996	17.625	0971.625	+30.0	2.3	18	D
61	6999	18.576	0972.576	+66.6	2.2	17	D

These velocities when plotted on the orbit of Ichinohe (Ap. J. 25, 318, 1907) agree very well for  $P = 6^d.39316$  and  $T_0 = 2416482.947$  JD.

HD 79439		18 Ursae Majoris		$\alpha = 9^h 9^m 0^s$		$\delta = +54^\circ 26'$		A5V
1	2378	1909 Feb 22.702	2418360.702	- 8.8	*4.0	3.5	J	
2	2388	28.717	8366.717	-15.7	3.7	4	J	
3	2430	Mar 22.653	8388.653	-11.5	2.3	4	J	

one line sec.

4	2451	26.670	8392.670	+18.4	+9.8	8	J	
5	2468	Apr 11.631	8408.631	- 7.4	7.8	4	J	
6	3435	1910 Mar 5.668	8736.668	-78.7	5.4	5	J	
7	3472	26.619	8757.619	-15.3	6.7	5	J	comparison weak
8	3483	Apr 2.566	8764.566	-50.6	14.3	4	J	
9	3489	9.617	8771.617	-27.0	9.9	3	J	
10	3543	May 5.550	8797.550	-19.5	0.3	4	J	
11	4184	1911 Feb 24.627	9092.627	+ 8.1	10.7	3	J	
12	4197	27.675	9095.675	+ 6.6	4.0	8	J	
13	4215	Mar 4.752	9100.752	-16.7	1.7	2	J	
14	4240	13.668	9109.668	-30.8	5.6	2.5 +143.2	J	0.5
15	4246	18.691	9114.691	-27.0	9.3	4	J	spectrum weak
16	4266	24.616	9120.616	-24.3	7.4	3	J	
17	4286	Apr 10.548	9137.548	-30.3	2.1	3	J	overexposed
18	4294	17.549	9144.549	-34.1	2.4	6	J	
19	4301	20.552	9147.552	+ 2.6	7.2	8	J	seed ?3
20	4303	23.579	9150.579	-15.9	9.4	6	J	
21	4306	24.550	9151.550	-21.6	3.6	5	J	overexposed
22	4320	26.545	9153.545	-41.7	9.8	2	J	
23	4326	May 4.575	9161.575	-12.4	4.4	13	J	seed 23
24	5048	1912 Feb 8.720	9441.720	-25.4	5.3	11	J	
25	5059	12.756	9445.756	-14.9	1.8	13	J	
26	5071	14.763	9447.763	-15.7	4.5	10	J	

27	5075	15.731	9448.731	-10.9	+4.4	8	J	
28	5078	16.671	9449.671	-11.5	4.9	11	J	
29	5084	17.669	9450.669	-12.9	7.9	8	J	
30	5087	22.737	9455.737	-16.6	7.2	9	J	
31	5094	23.729	9456.729	-61.0	11.4	4	J	
32	5098	Mar 5.668	9467.668	-50.4	5.3	7	J	
33	5101	10.679	9472.679	-19.1	5.4	9	J	
34	5109	13.709	9475.709	-19.8	3.5	4	J	
35	5115	16.689	9478.689	- 9.8	7.5	5	J	comparison weak
36	5122	17.709	9479.709	-11.3	2.5	3	J	spectrum weak
37	5125	18.723	9480.723	- 1.5	1.5	4	J	spectrum very weak
38	5129	22.694	9484.694	-21.9	4.3	11	J	
39	5134	25.661	9487.661	- 7.7	2.8	5	J	
40	5144	30.624	9492.624	- 9.2	8.9	4	J	
41	5152	Apr 3.684	9496.684	-38.4	4.5	4	J	
42	5156	4.609	9497.609	+14.0	7.9	8	J	
43	5188	19.645	9512.645	+ 3.0	7.3	12	J	
44	5189	20.545	9513.545	-19.5	3.0	13	J	
45	5197	21.569	9514.569	-35.6	4.0	18	J	
46	5201	23.548	9516.548	-18.9	2.8	13	J	
47	5208	24.548	9517.548	-15.6	5.1	17	J	
48	5219	May 1.575	9524.575	- 8.3	3.8	16	J	
49	5229	8.572	9531.572	+ 0.6	4.4	11	J	

50	5232	9.596	9532.596	-34.0	±3.3	8	J	
51	5637	1913 Jan 21.799	9789.799	-37.0	6.3	9	J	comparison weak pfer side
52	5652	Feb 12.721	9811.721	-17.7	4.4	5	J	
53	5665	19.761	9816.761	-28.6	15.6	4	J	
54	5688	Mar 15.607	9842.607	-38.1	8.6	4	J	spectrum weak
55	5701	19.620	9846.620	-20.6	4.9	18	J	
56	5706	22.615	9849.615	-31.3	4.9	11	J	
57	5710	28.674	9855.674	-25.3	4.3	8	J	
58	5715	Apr 1.601	9859.601	-35.0	5.5	10	J	
59	5721	7.638	9865.638	-28.9	5.3	13	J	spectrum weak
60	6666	1915 Apr 4.560	2420592.560	-23.9	5.8	19	J	
61	6667	8.542	0596.542	-14.5	5.0	23	J	
62	6669	8.662	0596.662	-26.7	6.6	8	J	
63	6670	8.719	0596.719	-20.2	4.9	11	J	

The lines in the spectrum of this star are very broad. These plates should be remeasured on an oscillographic measuring engine.

HD 85235	φ Ursae Majoris	α = 9 <sup>h</sup> 45 <sup>m</sup> 18 <sup>s</sup>	δ = +54° 32'	A35	
1 1107	1908 Jan 18.842	2417959.842	-27.5 ±1.9 8	B	identity of star uncertain
HD 90882	β Sextantis	α = 10 <sup>h</sup> 25 <sup>m</sup> 11 <sup>s</sup>	δ = -0° 07'	B6V	
1 1216	1908 Mar 9.707	2418010.707	+23.9 ±3.3 9	Sch1, 3 measures B,J	

2	1283	Apr 4.649	8036.649	- 3.2	*2.9	10	Schl, 3 measures B,J
3	1338	27.584	8059.584	+ 1.2	3.0	14	B,J 2 "
4	2334	1909 Feb 1.801	8339.801	+18.0	4.9	10	B,J 2 "
5	2402	Mar 7.792	8373.792	+19.5	4.3	13	B,J 2 "
6	2424	21.729	8387.729	+20.1	1.7	12	B,J 2
7	2440	23.633	8389.633	+16.7	2.3	11	B,J 2 "
8	3440	1910 Mar 10.677	8741.677	+14.0	3.9	9	D
9	3517	Apr 13.618	8775.618	+ 2.3	2.9	7	D
10	4178	1911 Feb 23.744	9091.744	- 6.5	6.5	4	D
11	4207	28.743	9096.743	+15.2	5.9	7	D
12	4222	Mar 6.926	9102.926	+16.1	7.8	4	J comparison weak
13	4231	10.947	9106.947	+ 3.1	5.4	8	J comparison weak
14	4260	21.670	9117.670	-11.4	12.5	2.5	D underexposed
15	4267	24.894	9120.894	- 3.0	6.3	7	J

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The small range (+20 to -11) and the early spectral type are indications that this star is probably not a spectroscopic binary.

HD 91312		$\alpha = 10^h 27^m 24^s$		$\delta = +40^\circ 56'$		A7V
1	1256	Mar 20.652	8021.652	+12.4	$\pm 8.0$	10 B
2	1305	Apr 13.601	8045.601	+ 7.7	2.4	6 B
3	1352	May 10.572	8072.572	+16.1	2.9	4 S
4	2458	1909 Mar 31.628	8397.628	+ 9.4	4.5	5 B
5	2465	Apr 10.623	8407.623	+35.6	3.8	9 B,0

6	2549	Jun	5.587	8463.587	+ 5.7	±2.3	5	B
7	2563		11.605	8469.605	+ 6.8	2.9	3	B
8	3442	1910 Mar	10.764	8741.764	-11.2	3.1	9	B
9	3450		17.662	8748.662	+ 7.6	5.2	6	D
10	3499	Apr	10.579.	8772.579	- 2.0	3.8	9	D
11	4159	1911 Jan	24.825	9061.825	-24.4	4.2	8	D
12	4185	Feb	24.653	9092.653	+ 3.9	4.1	14	D
13	4198		27.699	9095.699	- 2.4	4.3	10	D
14	4208		28.785	9096.785	- 6.2	5.7	6	D
15	4216	Mar	4.750	9100.750	-22.1	2.4	7	D
16	4223		6.701	9102.701	+ 4.3	2.2	4	D
17	4232		10.724	9106.724	-10.3	4.6	12	D
18	4247		18.727	9114.727	-16.8	5.6	7	D
19	4251		20.619	9116.619	+ 0.7	2.4	9	D
20	4261		21.718	9117.718	+ 6.7	4.8	8	D
21	4275		25.691	9121.691	- 2.0	4.0	5	D
22	4277		28.668	9124.668	- 3.5	1.9	8	D
23	4279		31.562	9127.562	+ 0.3	2.6	12	D
24	4282	Apr	9.676	9136.676	- 1.8	3.3	9	D
25	4295		17.594	9144.594	- 2.9	2.8	12	D
26	4327	May	4.624	9161.624	+ 9.7	5.3	8	D
27	5060	1912 Feb	12.819	9445.819	+ 1.0	3.5	14	D
28	5072		14.815	9447.815	- 1.0	4.4	8	D

- 74.1

1

29	5076	15.784	9448.784	- 0.7	4.8	11	D
30	5079	16.733	9449.733	+ 2.8	2.3	10	D
31	5085	17.718	9450.718	+11.9	2.6	10	D
32	5088	22.785	9455.785	+ 4.1	2.1	11	D
33	5095	23.781	9456.781	+ 4.5	2.5	14	D
34	5099	Mar 5.712	9467.712	- 3.7	1.3	10	D
35	5102	10.727	9472.727	+14.1	3.3	20	D
36	5110	13.750	9475.750	+10.0	2.1	14	D
37	5116	16.730	9478.730	+ 8.3	1.8	16	D

This star is a spectroscopic binary. Efforts to find a period have so far been unsuccessful. A recent series taken at Allegheny Observatory shows a range of +52 to -28 km/sec. There is some evidence of a long-period variation in both this series as well as the recent series. A period of 292.56 suggested by Abt (Ap. J. Suppl. 11, 429, 1912) does not fit this series. Observations are being continued.

0	HD 92825	41 Leonis Minoris	$\alpha = 10^h 37^m 59^s$	$\delta = +23^\circ 43'$	A2V .
1	1247 1908 Mar 12.698	2418013.698	+26.0	+6.3 4	B
2	1257 20.690	8021.690	+ 9.8	9.8 2	B
3	1288 Apr 6.606	8038.606	+14.6	1	S 1 line
4	2493 1909 May 12.628	8439.628	+19.3	5.5 5	J
5	4179 1911 Feb 23.788	9091.788	+37.8	14.6 4	J
6	4186 24.678	9092.678	+ 5.3	5.7 3	J
7	5162 1912 Apr 5.638	9498.638	+17.1	12.5 3	J poor plate
8	5167 10.617	9503.617	+32.9	0.0 3	J
9	5190 20.583	9513.583	- 1.0	12.5 4	J

10	5204	23.667	9516.667	+ 1.7	±3.9	6	J
11	5215	27.549	9520.549	- 3.7	1.5	6	J

The range in velocity for this series is in agreement with the published range of +43 to -1. This star is probably a spectroscopic binary.

51	HD 93152	42 Leonis Minoris	$\alpha = 10^h 40^m 18^s$	$\delta = +31^\circ 13'$	B9V			
1	5648	1913 Feb	7.769	2419806.769	+15.8 ±6.1	5	D	
2	5662		18.717	19817.717	- 4.0	12.4	3	D underexposed
3	5666		19.822	19818.822	+ 5.9	0.6	3	D
4	6648	1915 Feb	28.873	20557.873	+27.6	9.8	1	J
5	6652	Mar	1.785	20558.785	+ 4.3	5.0	3	D

51

Mean + 8.3

52	HD 94334	$\omega$ Ursae Majoris	$\alpha = 10^h 48^m 13^s$	$\delta = +43^\circ 43'$	A1V			
1	398	1907 Apr	21.704	2417687.704	-19.6	±2.0	16	D
2	399		21.778	7687.778	- 8.0	1.9	8	D
3	408		27.577	7693.577	-19.8	1.3	18	D
4	409		27.646	7693.646	-15.5	2.5	18	D
5	412		28.688	7694.688	-27.2	6.7	5	D underexposed
6	415	May	1.598	7697.599	-31.4	3.9	9	D
7	416		1.642	7697.642	-28.1	3.4	6	D
8	431		9.567	7705.601	- 8.0	2.7	14	D
9	432		9.601	7705.642	- 2.2	1.5	11	D
10	440		11.575	7707.575	-13.0	2.9	13	D

11	455	13.568	7709.568	-25.3	±2.5	12	D
12	456	13.597	7709.597	-33.0	3.3	11	D
13	466	14.611	7710.611	-36.1	7.0	7	D
14	5163	1912 Apr	5.678	-23.3	1.7	23	D
15	5221	May	3.582	+10.6	2.1	24	D
16	5224		4.566	+2.1	3.1	23	D
17	5239		10.576	-33.1	1.8	25	D

Phase RV plot compares with Ebbighasen, Publ. of D.A.O., Vol. 11, p. 268, 1963.  
 These observations fit the orbit of Parker (J.R.A.S. Can., 5, 377, 1911).

53 HD 98058  $\phi$  Leonis  $\alpha = 11^h 11^m 35^s$   $\delta = -3^\circ 06'$  A7 III-IV

1	2504	1909 May	17.647	2418444.647	-6.1	±7.0	3
2	2558	Jun	10.575	8465.575	-15.3	9.3	4
3	3491	1910 Apr	9.605	8771.605	+19.2	5.9	7
4	3545	May	5.625	8797.625	+0.4	3.4	2
5	4180	1911 Feb	23.834	9091.834	+13.6	10.5	3
6	4187		24.703	9092.703	-2.5	5.5	3

The published range (+27 to -18) is indicative of a spectroscopic binary. A possible very long period variation exists. This star is a possible spectroscopic binary.

54 HD 98292 55 Ursae Majoris  $\alpha = 11^h 13^m 41^s$   $\delta = +38^\circ 44'$  A2V

1	2267	1908 Dec	27.878	2418303.878	-11.5	±1.8	26	J
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2	2270	28.847	8304.847	+30.5	+5.9	5	J	
3	2292	1909 Jan	7.849	8314.849	+11.5	3.2	5	J
4	2335	Feb	1.842	8339.842	- 5.3	3.4	12	J
5	2347		6.754	8344.754	+ 5.2	5.2	10	J
6	2369		20.783	8358.783	+10.6	6.3	6	J
7	2384		25.729	8363.729	+12.2		1	J
8	2390		28.796	8366.796	- 1.3	7.9	6	J
9	2401	Mar	7.753	8373.753	- 0.3	5.7	7	J
10	2413		20.710	8386.710	+19.0	5.7	6	J
11	2420		21.645	8387.645	- 9.4		4	J
12	2433		22.722	8388.722	+ 4.7		1	J
13	2442		23.707	8389.707	-10.0	5.1	6	J
14	4188	1911 Feb	24.727	9092.727	-25.6	3.5	12	J
15	4199		27.722	9095.722	-11.1	3.4	16	J
16	4217	Mar	4.786	9100.786	- 6.4	2.0	11	J
17	4224		6.726	9102.726	-55.0	6.6	4	J
18	4233		10.750	9106.750	-31.3	13.1	2.5	J
19	4242		13.782	9109.782	- 6.4	3.1	11	J
20	4252		20.649	9116.649	+ 7.5	5.1	7	J
21	4262		21.755	9117.755	- 8.4	7.6	9	J
22	4268		24.678	9120.678	-32.1	4.7	8	J
23	4278		28.702	9124.702	-11.7	13.5	4	J
24	4280		31.624	9127.624	+ 1.9	2.0	16	J

spectrum weak  
one line

spectrum and  
comparison weak  
comparison weak

25	4287	Apr 10.601	9137.601	+ 0.1	±3.1	6	J	overexposed
26	4296	17.639	9144.639	- 8.9	2.3	16	J	
27	4302	21.623	9148.623	-28.9	2.8	18	J	
28	4304	23.633	9150.633	- 6.3	1.7	21	J	
29	4307	24.594	9151.594	-12.4	3.2	17	J	
30	4315	25.641	9152.641	+ 9.4	6.1	7	J	
31	4321	26.589	9153.589	-33.2	4.0	18	J	weak plate
32	4332	May 5.543	9162.543	-10.8	5.8	7	J	
33	4351	8.547	9165.547	- 0.3	5.8	4	J	
34	4357	9.544	9166.544	-25.8	4.0	6	J	
35	4363	10.578	9167.578	- 1.7	4.2	7	J	
36	4371	11.552	9168.552	-20.7	3.8	10	J	
37	4377	12.549	9169.549	-15.2	2.4	14	J	
38	4384	13.558	9170.558	- 9.1	3.5	4	J	
39	4398	19.569	9176.569	-35.4	2.4	8	J	
40	4411	24.576	9181.576	-38.0	1.7	5	J	
41	4427	26.578	9183.578	+ 5.9	7.3	4	J	
42	5050	1912 Feb 8.793	9441.793	-21.7	2.2	15	J	
43	5077	15.832	9448.832	- 9.4	7.0	9	J	
44	5080	16.775	9449.775	-19.8	2.9	10	J	spectrum weak
45	5086	17.766	9450.766	- 6.7	1.4	28	J	
46	5089	22.831	9455.831	+ 2.9	1.8	27	J	
47	5096	23.829	9456.829	-25.5	3.0	14	J	mean of 2

48	5103	Mar 10.777	9472.777	-15.8	+4.2	11	J	
49	5111	13.787	9475.787	-35.8	3.0	23	J	
50	5117	16.783	9478.783	- 5.8	2.2	26	J	
51	5126	18.770	9480.770	-11.2	3.7	16	J	
52	5130	22.731	9484.731	+ 5.0	6.2	8	J	
53	5135	25.704	9487.704	+ 1.3	1.8	38	J	
54	5145	30.667	9492.667	-14.7	2.4	18	J	
55	5153	1912 Apr 3.715	9496.715	- 3.3	1.2	33.5	J	comparison weak
56	5157	4.663	9497.663	- 1.9	8.0	8	J	
57	5168	10.667	9503.667	-39.2	2.3	25	J	
58	5173	11.605	9504.605	+ 0.3	1.8	32	J	
59	5181	14.642	9507.642	- 3.0	1.7	5	J	
60	5184	15.617	9508.617	-45.1	3.2	20	J	
61	5191	20.621	9513.621	-42.6	2.9	22	J	overexposed
62	5198	21.619	9514.619	- 6.1	2.1	36	J	
63	5202	23.592	9516.592	-38.9	1.6	27	J	
64	5209	24.592	9517.592	+ 1.6	2.5	16	J	
65	5216	27.589	9520.589	+37.3	4.9	11	J	all lines poor
66	5220	May 1.619	9524.619	- 6.3	1.9	28	J	
67	5222	3.638	9526.638	-34.8	3.0	17	J	
68	5225	4.620	9527.620	+ 5.7	3.3	24	J	
69	5230	8.617	9531.617	-33.3	3.1	19	J	
70	5233	9.639	9532.639	- 5.1	2.0	30	J	

71	5240	10.626	9533.626	- 7.9	+2.0	23	J
72	5246	13.575	9536.575	-26.9	3.8	14	J
73	5252	17.576	9540.576	- 5.6	3.7	18	J
74	5257	18.568	9541.568	-35.2	2.8	26	J
75	5277	30.576	9553.576	- 0.2	3.0	10	J
76	5283	31.578	9554.578	-38.9	1.8	19	J
77	5286	Jun 1.597	9555.597	+ 6.4	2.0	33	J
78	5289	3.591	9557.591	-27.9	1.8	25	J
79	5653	1913 Feb 12.771	9811.771	- 3.5	5.7	7	J
80	5656	13.713	9812.713	-37.5	3.4	15	J
81	5682	Mar 11.660	9838.660	-12.2	1.4	28	J
82	5689	15.682	9842.682	- 3.3	2.6	17	J
83	5692	17.717	9844.717	+15.4	6.3	8.5	J
84	5697	18.742	9845.742	-10.4	6.0	8.5	J
85	5702	19.704	9846.704	+ 1.7	5.6	16	J
86	5717	Apr 1.695	9859.695	- 3.5	3.9	13	J
87	5738	19.675	9877.675	+25.2	3.2	8.5	J
88	5753	29.557	9887.557	- 9.0	2.9	25	J
89	5774	May 3.612	9891.612	-16.2	3.5	16	J
90	5788	10.618	9898.618	+ 1.9	4.5	10.5	J
91	6671	1915 Apr 14.674	2420602.674	+ 1.6	4.3	20.5	J
92	6672	14.715	0602.715	+10.6	4.2	18	J
93	6674	15.608	0603.608	- 1.0	4.2	17.5	J

94	6675	15.695	0603.695	- 7.8	+2.8	16	J	weak
95	6676	15.762	0603.762	- 4.0	2.1	14	J	
96	6677	15.808	0603.808	-29.5	4.9	8	J	
97	6679	29.581	0617.581	- 2.9	2.8	21	J	
98	6680	29.674	0617.674	- 7.9	4.5	20	J	
99	6681	29.748	0617.748	- 1.2	3.5	11	J	weak
100	6931	1916 Jan 22.815	0885.815	-12.2	2.3	31	J	
101	7008	Apr 28.576	0981.576	-31.1	3.0	23.5	J	
102	7009	28.611	0981.611	-22.7	3.5	18.5	J	
103	7010	28.647	0981.647	-34.2	2.4	19	J	
104	7011	28.684	0981.684	-17.3	2.2	21	J	
105	7012	28.719	0981.719	-22.8	2.6	11	J	spectrum weak
106	7015	May 7.581	0990.581	+24.1	4.1	10	J	
107	7016	7.660	0990.660	+15.2	3.8	12	J	
108	7017	7.683	0990.683	+ 0.7	2.4	12	J	
109	7018	7.712	0990.712	- 4.7	7.5	8	J	weak
110	7021	8.565	0991.565	-32.3	3.8	19	J	
111	7026	9.554	0992.554	+ 4.5	3.3	25	J	

These velocities are published for what they may be worth. The plates should be remeasured on an oscilloscope measuring engine. There is some evidence of an ultra short period variation (ie. April 15 and May 7, 1915). If this is so then Henroteau's period of 2.5 days may be a beat phenomena.

HD 100889

$\alpha = 11^h 31^m 37^s$

$\delta = -9^\circ 15'$

B9V

1	2441	1909 Mar 23.681	2418389.681	+12.4	*11.3	2	J	
2	3501	1910 Apr 10.660	8772.660	+23.0	12.3	2.5	J	
3	3518	13.647	8775.647	+ 0.5	1.9	2	J	
4	3538	May 4.648	8796.648	-16.1	5.4	2	J	
5	3551	6.626	8798.626	+24.2	5.4	2	J	
6	4189	1911 Feb 24.751	9092.751	+17.4	8.2	3	J	
7	4225	Mar 6.755	9102.755	+41.8	0.6	1.5	J	spectrum and comparison weak
8	4234	10.775	9106.775	-19.5	6.1	4	J	
9	4297	Apr 17.682	9144.682	- 3.4	6.7	2	J	
10	4308	24.631	9151.631	+35.3	0.3	2	J	
11	4322	26.637	9153.637	- 3.0	8.6	1.5	J	
12	4333	May 5.572	9162.572	-20.7	7.1	2	J	
13	4352	8.573	9165.573	- 7.8	9.2	1.5	J	
14	4378	12.578	9169.578	-11.1	3.7	3.5	J	
15	4385	13.596	9170.596	-11.9	8.5	4	J	
16	4389	15.566	9172.566	-13.4	7.1	3.5	J	
17	5139	1912 Mar 26.666	9488.666	-15.4	3.7	4.5	J	weak
18	5203	Apr 23.634	9516.634	+17.9	6.9	2.5	J	
19	5258	May 18.612	9541.612	+28.9	12.3	2	J	
20	5297	Jun 5.570	9559.570	+11.4	5.3	4.5	J	
21	5300	6.585	9560.585	-17.6	0.7	2.5	J	
22	5304	7.584	9561.584	+15.3	8.6	3.5	J	
23	5312	9.586	9563.586	+53.7	20.1	2.5	J	spectrum weak

24	5696	1913 Mar 18.688	9845.688	-15.1	+9.2	3.5	J	poor spectrum
25	5707	22.702	9849.702	+29.0	4.0	3	J	spectrum weak
26	5716	Apr 1.653	9859.653	-11.5	6.6	4.5	J	
27	5726	16.612	9874.612	+13.0	6.4	3.5	J	
28	5732	17.612	9875.612	+12.4	10.2	3	J	
29	5737	19.627	9877.627	+18.0	6.9	5.5	J	
30	5747	20.621	9878.621	+28.5	4.6	2.5	J	
31	5745	21.633	9879.633	-25.0	3.0	3.5	J	
32	5749	23.623	9881.623	+16.0	3.3	1.5	J	
33	5754	29.604	9887.604	+ 1.9	7.4	5	J	
34	5759	30.564	9888.564	+13.3	3.1	3	J	
35	5764	May 1.560	9889.560	+14.6	3.3	3.5	J	
36	5769	2.559	9890.559	+20.3	8.1	2.5	J	
37	5773	3.561	9891.561	- 6.0	8.3	4.5	J	
38	5781	8.566	9896.566	- 6.9	1.1	2.5	J	
39	5785	9.566	9897.566	-16.6	12.3	3.5	J	
40	5787	10.570	9898.571	+ 1.0	10.6	2.5	J	
41	5792	11.564	9899.564	- 5.0	10.3	5.5	J	
42	5802	19.568	9907.568	- 5.4	1.8	5	J	
43	5804	20.568	9908.568	- 6.0	4.2	7	J	
44	5806	24.561	9912.561	-26.4	7.1	3	J	
45	5811	25.613	9913.613	+17.2	11.1	5.5	J	
46	5813	28.592	9916.592	- 6.4	5.3	6	J	

47	6161	1914 Jan 13.811	2420146.811	- 5.4	±2.8	4	J	spectrum weak
48	6191	Feb 24.813	0188.813	+ 7.8	9.2	4	J	
49	6202	27.763	0191.763	+18.9	9.3	5	J	
50	6208	Mar 11.767	0203.767	-44.7	25.3	3	J	spectrum weak
51	6223	20.729	0212.729	-22.3	1.1	3	J	spectrum weak
52	6225	23.712	0215.712	+ 9.7	6.9	3.5	J	
53	6246	Apr 13.669	0236.669	-23.8	15.1	3	J	
54	6262	May 1.625	0254.625	-16.7	3.6	6	J	
55	6266	2.561	0255.561	- 2.4	8.2	6	J	
56	6277	9.561	0262.561	-26.7	3.0	6.5	J	
57	6283	14.588	0267.588	-22.8	5.8	3.5	J	spectrum weak
58	6286	15.582	0268.582	+10.8	12.4	6.5	J	
59	6656	1915 Mar 9.811	0566.811	- 0.2	9.5	3	J	weak
60	6664	13.762	0570.762	-23.5		2	J	weak (one line)
61	6668	Apr 8.603	0596.603	+26.4	2.7	2	J	weak

This star appears to be a definite spectroscopic binary. These observations suggest a period of the order of 150 days. Further observations are needed.

HD 103287		δ Ursae Majoris	α = 11 <sup>h</sup> 48 <sup>m</sup> 34 <sup>s</sup>	δ = +54° 15'	AOV
1	2324	1909 Jan 24.889	2418331.889 - 9.3	±2.2 11	B
2	2421	Mar 21.664	8387.664 -63.2	3.3 2.5 + 72.0 9.2 2.5	B Double Lines?

Four more spectra taken in 1909 remain unmeasured. This star is definitely a spectroscopic binary according

to the observations of Mellor (Publ. Up. Mich. 3, 71, 1917). Plate 2421 was measured both as single and as double by Baker. Inspection of the plate on both the null projection engine and the Grant oscilloscopic engine reveals the spectrum to be double and therefore the double measures are quoted.

HD 103578      95 Leonis       $\alpha = 11^h 50^m 32^s$        $\delta = +16^\circ 12'$       A3V

A total of 102 velocities exist for the epoch 1912 to 1916. When plotted on the period of Struve and Morgan (Ap. J. 66, 135, 1927) they show evidence for a possible third body in the system as well as a need for a slight adjustment of the period. These velocities will be published separately in connection with a more extensive investigation incorporating recent observations.

HD 104321       $\pi$  Virginis       $\alpha = 11^h 55^m 45^s$        $\delta = +7^\circ 10'$       A4V

1 1315 1908 Apr 16.689 2418048.689 + 9.66  $\pm 4.4$  5 S

HD 106625       $\gamma$  Corvi       $\alpha = 12^h 10^m 40^s$        $\delta = -16^\circ 59'$       B8III

1 4269 1911 Mar 24.707 2419120.707 - 0.9  $\pm 4.8$  6 D

2 6678 1915 Apr 23.734 2420611.734 - 8.4 1.9 8 D

3 6688 May 8.564 0626.564 + 1.8 2.8 10 D

4 6690 10.698 0628.698 +10.9 1.8 5.5 D

5 6693 13.567 0631.567 +20.1 3.0 2.5 D

6 6694 15.572 0633.572 -12.3 3.2 8.5 D

7 6696 19.703 0637.703 - 6.2 3.8 4 D Double

8 6698 21.574 0639.574 + 2.4 3.0 7 D

9 6701 24.590 0642.590 - 9.9 6.5 8 D

10 7001 1916 Apr 18.654 0972.654 - 7.4 1.7 10 D

Mean - 3.0

These velocities together with the published velocities show a range of +20 to -20. In view of the early spectral type we consider it unlikely that this star is a spectroscopic binary.

HD 107750		12 Comae Berenices $\alpha = 12^{\text{h}}17^{\text{m}}29^{\text{s}}$			$\delta = +26^{\circ} 24'$		GOIII-IV+A3V
1	2240	1908 Nov 30.929	2418276.929	+24.7	$\pm 2.2$	10	J
2	2271	Dec 28.902	8304.902	+15.6	1.8	5	J
3	2371	1909 Feb 20.868	8358.868	-30.8	2.8	12	J
4	2415	Mar 20.766	8386.766	-26.0	2.8	12	J
5	2434	22.765	8388.765	-31.8	2.6	14	J
6	2443	23.733	8389.733	-23.1	2.6	10	J
7	2454	26.756	8392.756	-14.3	4.1	9	J
8	2459	31.686	8397.686	-19.6	2.7	23	J
9	2466	Apr 10.658	8407.658	-12.5	2.8	12	J
10	2485	May 11.658	8438.658	-21.1	4.0	12	J
11	3443	1910 Mar 10.795	8741.795	-20.5	4.0	15	J weak
12	3456	18.705	8749.705	-21.8	12.0	5	J comparison weak
13	3460	20.692	8751.692	-16.5	10.5	2	J very weak
14	3464	21.738	8752.738	-30.3	5.5	7	J
15	3475	26.719	8757.719	-40.8	11.1	2	J weak
16	3481	Apr 1.684	8763.684	-16.3	5.5	9	J weak spectrum and comparison
17	3488	8.622	8770.622	-23.8	9.8	8	J
18	3492	9.635	8771.635	-27.8	3.7	12	J

19	3509	12.635	8774.635	-28.4	+2.7	17	J
20	3527	21.589	8783.589	-20.7	4.6	15	J
21	3528	21.618	8783.618	-26.0	2.7	22	J Lumiere X plate
22	4190	1911 Feb 24.776	9092.776	-19.3	2.3	24	D mean of 2
23	4200	27.747	9095.747	+14.5	2.5	16	D
24	4235	Mar 10.804	9106.804	+11.1	2.5	17	D
25	4243	13.812	9109.812	+ 3.1	3.5	21	D
26	4253	20.681	9116.681	+ 5.8	2.9	23	D
27	4263	21.797	9117.797	-	-	-	D plate missing
28	4283	Apr 9.730	9136.730	-14.6	3.1	13	D
29	4288	10.642	9137.642	-20.3	3.7	15	D
30	4298	17.715	9144.715	-17.8	2.0	16	D
31	4305	23.674	9150.674	-18.3	3.8	12	D
32	4309	24.662	9151.662	-26.	3	7	D
33	4316	25.680	9152.680	-26.0	2.8	17	D
34	4323	26.676	9153.676	-24.7	5.8	6	D
35	4328	May 4.667	9161.667	-20.1	2.2	17	D
36	4334	5.599	9162.599	-26.8	3.2	16	D
37	4343	6.638	9163.638	-30.2	1.7	15	D
38	4353	8.606	9165.606	-27.1	1.5	18	D
39	4358	9.575	9166.575	-34.4	1.6	15	D
40	4364	10.608	9167.608	-29.0	2.9	17	D
41	4373	11.615	9168.615	-27.2	4.4	12	D

42	4379	12.608	9169.608	-29.4	+2.2	17	D
43	4386	13.635	9170.635	-29.0	2.7	14	D
44	4390	16.605	9172.605	- 0.1	3.2	7	D
45	4400	20.651	9177.651	-17.9	2.4	15	D
46	4407	21.635	9178.635	-28.2	1.6	14	D
47	4412	24.617	9181.617	-24.2	3.9	12	D
48	4419	25.564	9182.564	-21.0	1.6	14	D
49	4428	26.619	9183.619	-30.8	3.0	8	D
50	4434	27.568	9184.568	-20.6	2.6	15	D
51	4442	28.613	9185.613	-26.6	3.3	11	D
52	5118	1912 Mar 16.822	9478.822	- 6.0	5.1	12	D
53	5127	18.834	9480.834	+ 6.4	2.4	16	D
54	5131	22.801	9484.801	+14.0	1.4	29	D seed 23
55	5136	25.756	9487.756	+15.4	1.6	20	D
56	5140	26.713	9488.713	+19.9	1.5	23	D
57	5146	30.713	9492.713	+12.8	1.6	24	D
58	5154	Apr 3.772	9496.772	+15.9	1.5	27	D seed 23
59	5158	4.710	9497.710	+13.8	1.8	19	D
60	5169	10.723	9503.723	+ 6.8	6.8	23	D
61	5127	11.695	9504.695	+11.7	3.1	14	D
62	5182	14.694	9507.694	+ 3.8	3.7	12	D
63	5185	15.694	9508.694	+ 0.2	2.8	14	D
64	5192	20.663	9513.663	+ 2.0	2.4	22	D

65	5199	21.667	9514.667	+ 4.2	*1.7	18	D
66	5205	23.700	9516.700	+ 5.7	1.7	19	D
67	5210	24.631	9517.631	+ 7.4	1.5	18	D
68	5217	27.634	9520.634	- 5.2	2.5	17	D
69	5223	May 3.703	9526.703	- 0.2	2.2	8	D
70	5226	4.667	9527.667	-15.8	3.1	17	D
71	5231	8.678	9531.678	-22.6	2.9	14	D
72	5234	9.684	9532.684	-27.6	2.3	20	D
73	5247	13.640	9536.640	-35.6	3.7	16	D
74	5251	16.665	9539.665	-32.1	3.4	14	D
75	5253	17.649	9540.649	-26.5	0.8	24	D seed 23
76	5260	20.569	9543.569	-30.3	1.8	16	D
77	5273	27.601	9550.601	-30.1	2.0	15	D
78	5278	30.620	9553.620	-32.1	1.9	14	D
79	5284	31.627	9554.627	-28.7	1.6	23	D
80	5290	Jun 3.635	9557.635	-27.4	2.3	17	D
81	5298	5.615	9559.615	-30.1	1.6	12	D
82	5308	8.592	9562.592	-29.3	1.8	26	D
83	5320	11.572	9565.572	-21.8	1.3	20	D
84	5326	20.592	9574.592	-27.5	1.8	16	D
85	5332	28.605	9582.605	-17.7	2.1	11	D
86	5336	30.606	9584.606	-17.6	2.9	8	D underexposed
87	5338	Jul 2.576	9586.576	-15.6	2.5	12	D

88	5341	6.581	9590.581	-20.4	±3.6	13	D
89	5352	12.610	9596.610	-20.4	2.9	8	D
90	5354	14.590	9598.590	-20.0	2.6	15	D
91	5548	Nov 3.942	9710.942	-21.4	6.0	4	D underexposed
92	5678	1913 Mar 6.807	9833.807	+13.1	1.9	22	D
93	5684	11.751	9838.751	+10.7	1.5	20	D
94	5693	17.783	9844.783	+ 3.9	2.0	23	D
95	5698	18.789	9845.789	+ 5.6	2.2	16	D
96	5712	28.803	9855.803	+14.9	2.1	23	D
97	5719	Apr 1.788	9859.788	-13.8	4.2	6.5	D underexposed
98	5723	7.774	9865.774	+11.4	2.3	23	D dust lines
99	5728	16.725	9874.725	+17.8	2.2	22	D
100	5734	17.754	9875.754	+13.8	1.6	19	D
101	5742	20.746	9878.746	+22.3	2.0	22.5	D
102	5746	21.701	9879.701	+16.2	2.7	18.5	D
103	5751	23.765	9881.765	+13.3	3.9	9	D underexposed
104	5756	29.724	9887.724	+12.1	3.0	22	D
105	5261	30.687	9888.687	+11.5	2.7	22	D
106	5766	1913 May 1.681	9889.681	+17.4	2.4	23	D
107	5771	2.692	9890.692	+ 9.2	2.0	17.5	D
108	5778	7.712	9895.712	+13.6	3.6	14	D
109	5783	8.696	9896.696	+13.8	3.5	13	D
110	5789	10.665	9898.665	+ 6.3	3.4	10.5	D

111	5794	11.678	9899.678	+11.8	±2.6	14	D
112	6230	1914 Mar 24.815	2420216.815	-26.3		2	D
113	6237	Apr 5.806	0228.806	+ 8.2	1.6	15	D
114	6243		0235.794	+14.8	2.3	14	D
115	6259		0253.669	+17.9	2.5	16	D
116	6268	May 2.663	0255.663	+13.5	3.1	18.5	D
117	6273		0261.705	+ 7.0	2.8	18.5	D
118	6300		0270.664	+13.5	2.6	11	D
119	6334		0280.612	+14.6	1.8	15.5	D

underexposed  
one line only

The observations about periastron in 1912 agree well with the Lick observations about periastron in 1935 (Vinterhansen, LOB 19, 101, 1940).

1 74

HD 109485		23 Comae Berenices $\alpha = 12^h 29^m 52^s$		$\delta = +23^\circ 11'$		AO1V.	
						B, J	mean of 2
1	1251	1908 Mar 12.767	2418013.767	-19.0	±3.6	9	
2	1337	Apr 12.646	8044.646	-14.1	6.4	5	J
3	1374	May 20.594	8082.594	-25.7	3.7	7	J
4	1400	25.576	8087.576	- 1.2	5.1	7	J
5	2372	1909 Feb 20.914	8358.914	-22.7	3.3	6	J
6	2403	Mar 7.846	8373.846	-25.0	2.7	6	J
7	4201	1911 Feb 27.774	9095.774	-19.9	4.3	5	J
8	4254	Mar 20.710	9116.710	-27.0	6.0	6	J
9	5170	1912 Apr 10.760	9503.760	-20.8	3.2	13	J
				Mean -19.5			

A great many published velocities exist for this star. From a long series obtained at Ottawa, Harper (Publ. D.O. 4, 289, 1919) concludes that this star is an unresolved spectroscopic binary. Our mean is therefore provisional.

HD 110411       $\rho$  Virginis       $\alpha = 12^h 36^m 49^s$        $\delta = +10^\circ 47'$       AOV

1 1266 1908 Mar 21.765 2418022.765 -31.11  $\pm$  12.2 3 J

HD 114330       $\theta$  Virginis       $\alpha = 13^h 4^m 46^s$        $\delta = -5^\circ 00'$       A1V

1 4226 1911 Mar 6.788 2419102.788 - 0.6  $\pm$  2.0 13 J

2 4255 20.747 9116.747 -12.5 4.1 6 J

3 4270 24.642 9120.642 - 7.2 1.2 10 J

4 4299 Apr 17.751 9144.751 - 6.4 1.1 21 J

5 4310 24.694 9151.694 - 8.6 2.6 10 J

6 4317 25.714 9152.714 + 2.2 5.3 7 J

This star is a spectroscopic binary with a period of 13.6 years (Wagman, Bull. A.A.S. 1, 2, 1969). Observations are continuing and will be discussed in a combined astrometric-spectroscopic analysis.

HD 116842      80 Ursae Majoris       $\alpha = 13^h 21^m 13^s$        $\delta = +55^\circ 31'$       A5V

1 1582 1908 Jul 4.592 2418127.592 -16.6  $\pm$  6.1 6 J

2 1583 4.615 8127.615 -55.6 8.1 4 J

3 1588 5.575 8128.575 -10.7 3.8 6 J

4 1589 5.594 8128.594 -19.5 3.6 4 J

5 1603 8.567 8131.567 -10.7 4.7 3 J

6 1604 8.595 8131.595 -47.3 2 J 1 line only

Abt (Ap. J. suppl. 11, 429, 1965) tentatively concludes that this star is not a spectroscopic binary.

i5	HD 118232	24 Canum Venaticorum	$\alpha = 13^h 30^m 22^s$	$\delta = +49^\circ 32'$	A4V			
1	6251	1914 Apr 17.815	2420240.815	+ 2.4	$\pm 6.2$	3	D	underexposed
2	6256	27.769	0250.769	-41.0	8.0	3.5	D	
3	6260	30.756	0253.756	-21.1	6.7	5	D	
4	6269	May 2.711	0255.711	-17.5	9.3	9	D	
5	6279	9.690	0262.690	-21.4	5.2	7	D	
6	6285	14.756	0267.756	+10.6	7.3	3	D	underexposed
7	6288	15.711	0268.711	- 7.0	10.5	7	D	
8	6293	16.617	0269.617	-42.3	4.7	7	D	
9	6301	17.733	0270.733	-17.5	5.2	3	D	
10	6304	18.647	0271.647	-14.9	4.6	7.5	D	
11	6309	19.622	0272.622	-29.9	3.6	5	D	
12	6314	20.674	0273.674	-21.5	2.8	5	D	
13	6319	21.713	0274.713	-19.9	5.8	4	D	

14	6322	22.674	0275.674	- 7.9	±6.1	3.5	D
15	6323	24.693	0277.693	+33.2	2.2	3	D
16	6327	25.701	0278.701	- 4.8	3.2	6	D
17	6331	26.658	0279.658	-12.0	6.5	6.5	D
18	6335	27.612	0280.612	-11.6	10.8	3	D
19	6337	28.709	0281.709	-12.5	4.0	2	D
20	6339	30.651	0283.651	-28.2	4.0	8	D
21	6349	Jun 2.663	0286.663	-10.6	4.9	5	D
22	6369	15.592	0299.592	-26.1	5.8	4	D
23	6370	16.585	0300.585	- 2.8	7.5	9	D
24	6378	23.588	0307.588	-13.1	4.6	4	D
25	6383	Jul 2.610	0316.610	- 5.0	5.7	4	D
26	6387	3.597	0317.597	Mean	-15.3		comparison lacking on one side

Even though there is a range of +33 km/sec. to -42 km/sec., efforts to find a period have failed and we conclude that this star is probably not a spectroscopic binary.

HD 120315				n Ursae Majoris	$\alpha = 13^h 43^m 36^s$	$\delta = +49^0 49'$	B3V	
1	2423	1909 Mar	21.700	2418387.700	-21.2	$\pm 3.7$	5	B
2	2446		23.809	8389.809	-26.1	2.2	12	B mean of 2
3	2544	May	31.649	8458.649	-30.0	3.9	5	D
4	2562	Jun	11.578	8469.578	-17.4	2.2	10	D
5	2564		11.628	8469.628	-19.3	5.7	7	D

6	2571	13.582	8471.582	-27.1	±2.9	9	D
7	2575	15.617	8473.617	-13.7	4.4	8	D
Mean -22.0							
HD 124224		CU Virginis		$\alpha = 14^h 07^m 12^s$		$\delta = +2^\circ 53'$	
						Asi	
1	2425	1909 Mar 21.788	2418387.788	+ 4.2	± 2.2	5	B
2	2444		8389.758	+ 6.8		2	B 1 line only
3	2467	Apr 10.697	8407.697	+15.3	6.1	2	B
4	2550	Jun 5.694	8463.694	+54.8	5.8	5	B
5	2565		8469.653	- 2.2	5.1	3	B,D lines perhaps double
6	2572		8471.607	-47.3	7.0	3	B
7	2576		8473.639	-27.9	2.0	5	B
8	3502	1910 Apr 10.693	8772.693	-24.6	7.4	2	B
9	3510		8774.673	-13.4		1	B 1 line only
10	3519		8775.635	-26.0	1.3	2	B
11	3540	May	8796.684	+ 8.7	1.0	6	D mean of 2
12	3552		8793.674	-16.6	0.4	4	D
13	3561		8807.606	+ 0.6	4.0	6	D
14	3605	Jun 22.578	8845.578	-41.6	10.5	5	D
15	3613		8848.580	-36.7	1.3	3	* also measured as double
16	4191	1911 Feb 24.804	9092.804	-20.6	4.2	4	D
17	4256	Mar 20.780	9116.780	-34.0	1.6	7	D
18	4271		9120.778	-87.1	1.9	4	* also measured as double
19	4284	Apr 9.783	9136.783	- 5.3	2.5	5	D

20	4289	10.686	9137.686	+ 1.4	±5.2	6	D
21	4300	17.801	9144.801	-23.4	2.8	4	D
22	4311	24.737	9151.737	- 6.1	5.1	3	D
23	4318	25.767	9152.767	+ 4.0	3.1	5	D
24	4324	26.734	9153.734	-16.8	5.7	5	D
25	4329	May 4.734	9161.734	+ 3.9	3.4	5	D
26	4335	5.627	9162.627	- 9.1	1.9	5	D
27	4344	6.672	9163.672	- 9.8	4.1	3	D
28	4354	8.641	9165.641	+ 2.8	7.2	3	D
29	4359	9.606	9166.606	-11.9	8.5	5	D
30	4365	10.641	9167.641	- 3.6	9.7	3	D
31	4372	11.580	9168.580	-24.8	5.7	3	D
32	4380	12.638	9169.638	+25.9	2.5	3	D
33	4387	13.678	9170.678	+19.5	5.7	5	D
34	4391	15.649	9172.649	- 2.5	0.3	3	D
35	4392	17.640	9174.640	-17.4	6.3	3	D
36	4395	18.715	9175.715	-25.9	7.1	4	D
37	4399	19.615	9176.615	+25.9	5.1	3	D
38	4401	20.685	9177.685	-14.2	6.2	5	D
39	4408	23.657	9180.657	-18.2	10.0	5	D
40	4413	24.653	9181.653	- 7.7	8.8	4	D
41	4420	25.594	9182.594	+ 7.4	6.1	5	D
42	4429	26.659	9183.659	+11.4	16.8	1.5	D

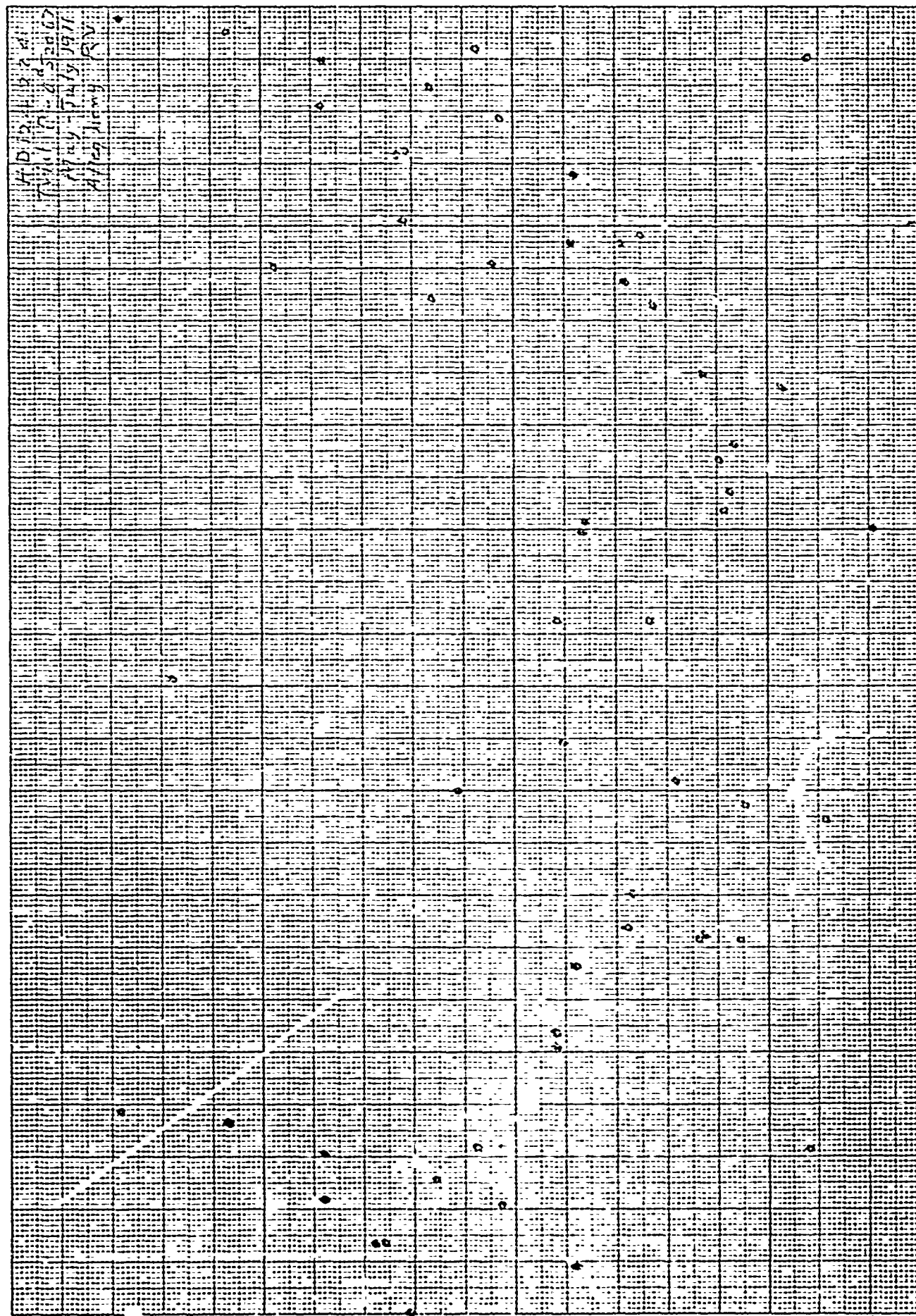
plate very weak

mean of 2

43	4435	27.608	9184.608	+ 3.2	6.5	5	D
44	4443	28.658	9185.658	-11.8	5.6	4	D
45	4445	29.580	9186.580	-32.0	2.9	5	D
46	4453	Jun 1.570	9189.570	-21.7	3.4	5	D
47	4460	3.581	9191.581	- 7.6	1.3	4	D
48	4465	8.598	9196.598	+14.9	2.7	4	D
49	4472	10.574	9198.574	-21.5	6.1	4	D
50	4479	12.506	9200.596	- 9.2	2.5	9	D
51	4485	14.602	9202.602	-15.8	3.5	5	D
52	4489	15.588	9203.588	-14.5	6.0	5	D
53	4494	1911 Jun 18.591	9206.591	- 1.7	2.9	4	D
54	4499	19.576	9207.576	- 9.1	2.0	5	D
55	4504	20.585	9208.585	- 8.5	3.6	9	D
56	4509	21.599	9209.599	-15.3	4.8	6	D
57	4515	22.568	9210.568	-21.4	5.4	5	D
58	4522	23.581	9211.581	-20.1	2.0	5	D
59	4532	27.602	9215.602	-29.8	4.7	4	D
60	4534	28.588	9216.588	-21.1	3.6	5	D
61	4539	29.572	9217.572	- 7.4	7.0	3	D
62	4545	30.563	9218.563	-11.9	4.3	4	D
63	4553	Jul 1.580	9219.580	- 2.7	2.2	3	D
64	4560	2.566	9220.566	-13.6	1.5	5	D
65	4566	3.602	9221.602	-12.0	0.6	5	D

Fig. 1

V  
Phase



0.5 P=0.52067

0.4

0.3

0.2

0.1

81

Phase (days)

66	4573	4.581	9222.581	-18.0	±2.4	2	D
67	4592	9.588	9227.588	+ 0.8	10.2	4	D
68	4604	14.577	9232.577	+ 5.7	4.0	4	D
69	4630	26.583	9244.583	+ 1.6	2.8	4	D

This star was announced as a spectroscopic binary by Schlesinger (Publ. A.O. 1, 121, 1909) who stated that a range of 134 km/sec. had been observed. Subsequent work at other observatories have shown that this star is a spectrum and light variable with a period of 0.52067 day. The question of variability in radial velocity has never been adequately settled. Daniel measured these plates in 1911 and of course knew nothing of the 1/2-day cycle. A plot of his measures for the May-June 1911 observations ( $T_0 = 2419161.734$ ) against the 1/2-day cycle is shown in Figure 1. A variation is indeed present despite the large scatter and appears to somewhat resemble a pulsation. No attempt has been made to correlate this with the light curve. Since a recent series at Allegheny has been measured from an entirely different interpretation, these results are hereby presented "as is" with no attempt at an explanation.

HD 126129		$\alpha = 14^h 18^m 28^s$		$\delta = +8^{\circ} 54'$		A1
1	2460 1909 Mar 31.715	2418397.715	-12.4	±4.3	6	B
2	2487 May 11.721	8438.721	-21.9	14.1	5	B
3	2545 31.672	8458.672	-18.8	7.2.	5	B
4	2573 Jun 13.642	8471.642	-36.1	9.1	7	B
5	2596 19.624	8477.624	-32.1	7.3	5	B
6	2654 Jul 7.608	8495.608	- 8.7	6.5	4	B
7	3493 1910 Apr 9.682	8771.682	-32.0	6.9	7	D
8	3503 10.725	8772.725	-35.1	5.5	6	D
9	4360 1911 May 9.640	9166.640	+ 3.9	2.3	4	D
10	4375 11.701	9168.701	- 6.4	3.7	4	D
11	5211 1912 Apr 24.671	9517.671	-22.6	5.8	7	D

Visual binary with HD 126128 (ADS9247), P= 40%0, T= 1918.45.

HD 126248

$\alpha = 14^h 19^m 13^s$

$\delta = +6^\circ 16'$

A3

1	2461	1909 Mar	31.739	2418397.739	-16.3	10.1	4	J	
2	2472	Apr	15.731	8412.731	+45.4	8.0	4	J	comparison weak
3	2506	May	17.719	8444.719	-33.9	3.6	4	J	pier side
4	2536		29.620	8456.620	+ 6.1	10.1	4	J	
5	2584	Jun	16.643	8474.643	+ 8.9	3.9	8	J	
6	2590		18.633	8476.633	-33.4	11.1	4	J	
7	2601		20.578	8478.578	-26.8	2.6	3	J	
8	2610		22.610	8480.610	-23.3	6.7	4	J	
9	2615		29.599	8487.599	- 3.6	6.2	4	J	mean of 2
10	2621		30.576	8488.576	- 4.5	4.7	6	J	weak spectrum
11	2629	Jul	1.633	8489.633	- 1.7	5.7	3	J	
12	2633		3.590	8491.590	-19.0	4.7	7	J	
13	2650		6.626	8494.626	-29.3	6.8	3	J	
14	2653		7.577	8495.577	-30.3	2.3	4	J	
15	2663		8.575	8496.575	-18.1	4.5	4	J	
16	2671		9.597	8497.597	-33.6	2.9	3	J	spectrum weak
17	3465	1910 Mar	21.783	8752.783	-44.2	7.8	3	J	very weak
18	3494	Apr	9.715	8771.715	- 3.4	5.8	3	J	
19	3504		10.749	8772.749	+ 5.6	9.1	2	J	
20	3511		12.722	8774.722	+ 1.6	3.0	2	J	

CO

21	3520	13.721	8775.721	-10.2	+1.3	3	J	
22	3529	21.688	8783.688	-27.1	3.4	4	J	
23	3546	May 5.664	8797.664	-26.0	5.4	3	J	
24	3553	6.717	8798.717	-27.0	3.6	4	J	
25	3558	12.685	8804.685	- 9.8	1.5	5	J	
26	3563	15.660	8807.660	-29.0	2.7	4	J	
27	3570	18.681	8810.681	+33.4		1	J	one line, diffuse
28	3574	27.638	8819.638	-13.5	11.6	3	J	
29	3583	Jun 7.590	8830.590	- 8.9	5.0	7	J	
30	3591	8.583	8831.583	+ 1.5	6.3	6	J	mean of 2
31	3596	14.635	8837.635	-10.8	4.5	5	J	82.7 apparently double
32	3599	20.600	8843.600	-21.4	28.0	2	J	
33	3606	22.588	8845.588	-15.8	18.5	2	J	spectrum weak
34	3609	24.589	8847.589	-16.8		2	J	one line only
35	3614	25.613	8848.613	+24.9	19.6	2	J	spectrum weak
36	3646	Jul 14.588	8867.588	- 5.2	3.0	5	J	
37	4202	1911 Feb 27.806	9095.806	+14.4		2	J	one line only spectrum weak
38	4257	Mar 20.810	9116.810	- 4.0	0.6	3	J	
39	4290	Apr 10.730	9137.730	-23.4	3.9	3	J	
40	4312	24.778	9151.778	-20.7	1.3	2	J	
41	4337	May 5.684	9162.684	-24.0	3.3	3	J	comparison fuzzy slightly out of focus
42	4345	6.703	9163.703	-33.2	2.1	3	J	
43	4355	8.674	9165.674	+22.0	7.8	3	J	

44	4361	9.669	9166.669	+17.8	±0.2	4		J	
45	4366	10.674	9167.674	-87.1	8.9	6	+ 73.9 ±11.3	J	
46	4374	11.657	9168.657	-40.7	2.5	3		J	
47	4381	12.667	9169.667	-27.8		1		J	one line only
48	4393	17.685	9174.685	-34.1		1		J	spectrum weak one line only
49	4402	20.720	9177.720	- 3.7	2.7	4		J	
50	4414	24.688	9181.688	+17.5	11.6	4		J	
51	4421	25.626	9182.626	- 1.9	7.8	6		J	
52	4436	27.648	9184.648	- 0.1	17.6	3		J	
53	4446	29.622	9186.622	-54.6	10.9	5		J	
54	4454	Jun 1.608	9189.608	-24.1	0.9	5		J	.
55	4473	1911 Jun 10.608	9198.608	-10.1	2.0	7		J	
56	4578	Jul 5.574	9223.574	-32.4	3.4	6		J	
57	4584	6.578	9224.578	+10.6	4.6	3		J	
58	5104	1912 Mar 10.826	9472.826	+44.8		2		J	spectrum weak one line only
59	5141	26.755	9488.755	-32.2		1		J	spectrum weak one line only
60	5147	30.756	9492.756	-16.6	9.9	3		J	spectrum weak one line only
61	5159	Apr 4.754	9497.754	- 4.3	16.2	3		J	spectrum weak
62	5178	11.749	9504.749	+57.4	2.9	3		J	
63	5183	14.772	9507.772	+30.8		1		J	one very diffuse line only
64	5200	21.725	9514.725	-29.7	3.2	4		J	
65	5206	23.742	9516.742	-28.1	3.3	5		J	
66	5235	May 9.742	9532.742	-13.3	3.8	12		J	

67	5248	13.715	9536.715	+ 8.6	±3.5	3	J	
68	5261	20.640	9543.640	+34.5	16.2	2	J	diffuse lines
69	5287	Jun 1.655	9555.655	-21.5	3.8	6	J	
70	5309	8.648	9562.648	-11.4	6.4	8	J	
71	5757	1913 Apr 29.768	9887.768	+ 2.7	8.2	4	J	
72	5790	May 10.712	9898.712	+ 8.4	9.2	4	J	spectrum weak
73	5799	18.688	9906.688	+32.3	7.5	5	J	spectrum weak
74	6371	1914 Jun 16.636	2420300.636	-33.4	6.6	3	J	

This star is a probable spectroscopic binary. Efforts to find a period have been unsuccessful.

	HD 135742		♌ Librae	$\alpha = 15^h 11^m 31^s$	$\delta = -9^\circ 01'$	B8V	mean of 2 measured twice
1	2684	1909 Jul 17.608	2418505.608	-50.0	±1.4	4	B
2	2685	17.628	8505.628	-39.8	1.5	4	B
3	2700	19.606	8507.606	-37.1	4.3	5	B
4	2701	19.619	8507.619	-49.3	2.7	4	B
5	2709	20.580	8508.580	-46.9	0.9	5	B
6	2712	24.566	8512.566	-47.9	2.0	6	B
7	2711	24.578	8512.578	-43.5	3.5	4	B
8	2790	Aug 10.569	8529.569	-53.8	3.8	4	B
9	6261	1914 Apr 30.821	2420253.821	-32.7	10.5	3	D
10	6264	May 1.783	0254.783	-30.8	5.4	3	D
11	6271	2.790	0255.790	-44.1	1.3	3	D

12	6274	8.757	0261.757	-52.0	±3.3	3	D
13	6275	8.787	0261.787	-56.3	3.0	3	D
14	6281	9.776	0262.776	-48.4	3.3	3	D
15	6289	15.760	0268.760	-50.5	3.8	3	D
16	6290	15.783	0268.783	-52.6	7.6	3	D
17	6295	16.689	0269.689	-51.6	4.8	3	D
18	6296	16.702	0259.702	-37.2	2.5	3	D
19	6302	17.784	0270.784	-34.4	5.7	3	D
20	6305	18.714	0271.714	-55.7	9.5	3	D
21	6306	18.740	0271.740	-49.8	4.8	3	D
22	6310	19.662	0272.662	-61.4	2.2	3	D
23	6311	19.684	0272.684	-49.7	1.3	3	D
24	6315	20.735	0273.735	-38.8	3.3	3	D
25	6316	20.767	0273.767	-45.2	0.3	3	D
26	6320	21.785	0274.785	-26.3		2	D 1 line only
27	6324	24.755	0277.755	-32.4	6.4	2	D
28	6325	24.781	0277.781	-52.9	4.5	3	D underexposed
29	6328	25.773	0278.773	-36.0	3.5	3	D
30	6332	26.722	0279.722	-44.0	0.6	3	D
31	6340	30.696	0283.696	-51.9	3.2	3	D
32	6345	Jun 1.719	0285.719	-39.5	4.8	3	D
33	6346	1.756	0285.756	-36.7	14.3	3	D
34	6350	2.707	0286.707	-24.6	3.5	3	D

35	6351	2.731	0286.731	-23.3	±1.9	3	D
36	6354	6.683	0290.683	-46.0	5.4	3	D
37	6359	8.706	0292.706	-50.1	3.5	3	D
38	6361	9.689	0293.689	-42.5	7.8	3	D
39	6364	10.700	0294.700	-36.8	2.5	3	D
40	6366	12.696	0296.696	-30.3	2.9	3	D
41	6372	16.672	0300.672	-27.9	2.9	3	D
42	6376	17.651	0301.651	-40.2	0.9	3	D
43	6381	28.612	0312.612	-37.6	2.5	3	D
44	6382	29.636	0313.636	-57.4	4.8	3	D
45	6384	Jul 2.663	0316.663	-67.8	5.4	3	D
46	6388	3.647	0317.647	-50.3	7.0	3	D
47	6392	5.612	0319.612	-57.2	1.0	3	D
48	6400	15.590	0329.590	-53.6	1.9	3	D
49	6406	20.572	0334.572	-70.5	9.5	3	D
50	6411	21.575	0335.575	-69.7	5.4	2	D
51	6673	1915 Apr 14.833	0602.833	-40.4	0.6	3	D

Mellor (Publ. Mich. O. 3, 73, 1917) states that 79 radial velocities obtained at Michigan in 1914 show an 80-day period. Here we present 42 radial velocities obtained in 1914 also. These when plotted as 10-day means also clearly show the 80-day period. Oddly, however, the indicated  $\alpha$ -velocity for the Allegheny observations seems to be closer to -55 km/sec whereas Mellor claims -37 km/sec for the Michigan observations. This star is a spectroscopic binary.

B9V

$\delta = +33^{\circ} 17'$

$\alpha = 15^h 17^m 48^s$

50 Bootis

HD 136849

71

1	5254	1912 May	17.738	2419540.738	- 5.2	$\pm 3.0$	2		D	underexposed
2	5263		22.651	9545.651	+ 9.1		1		D	underexposed
3	5285		31.691	9554.691	-24.3	1.4	4		D	one line only
4	5305	Jun	7.658	9561.658	-17.0	10.2	3		D	
5	5313		9.661	9563.661	-13.7	1.9	3		D	
6	5316		10.603	9564.603	-18.6	8.9	3		D	
7	5321		11.646	9565.646	-18.7	1.7	2		D	
8	5323		13.610	9567.610	-18.2	7.3	3		D	
9	5795	1913 May	11.736	9899.736	-20.0	3.6	3		D	
10	5823	Jun	2.702	9921.702	-16.6	6.4	2		D	diffuse lines
11	5837		9.701	9928.701	-26.8	4.1	5		D	seed 23

Frost, Barrett, and Struve (Ap. J. 64, 1, 1926) list for Yerkes Observatory, three radial velocities of +53, +2 and +71 and two radial velocities in 1915 of +94 and -3 which are only 40 days apart. We consider this star to be a spectroscopic binary. Further observations will be necessary.

2	HD 139006	$\alpha$ Coronae Borealis	$\alpha = 15^{\text{h}}30^{\text{m}}27^{\text{s}}$	$\delta = +27^{\circ} 3'$	AOV			
1	6758	1915 Jul	11.561	2420690.561	-20.6	$\pm 5.1$	5	J
3	HD143275	$\delta$ Scorpius	$\alpha = 15^{\text{h}}54^{\text{m}}25^{\text{s}}$	$\delta = -22^{\circ} 20'$	BOV			
1	5236	1912 May	9.785	2419532.785	-12.3	$\pm 5.3$	9	D
2	5243		10.747	9533.747	- 5.9	1.3	7	D
3	5249		13.762	9536.762	-13.2	2.4	7	D
4	5255		17.788	9540.788	- 2.5	5.0	6	D

5	5265	22.725	9545.725	-18.2	+5.2	5			D
6	5270	24.720	9547.720	-9.4	0.9	8			D
7	5274	27.584	9550.684	-2.7	5.8	8			D
8	5280	30.732	9553.732	-13.5	2.6	6		-14.2	2
9	5293	Jun 4.684	9558.684	-12.2	2.0	8		+10.4	1
10	5302	6.709	9560.709	-10.0	2.4	8		-19.6	2
11	5314	9.722	9563.722	-16.9	2.4	8		-5.1	1
12	5324	13.664	9567.664	-16.2	3.3	8		-15.8	1
13	5327	20.631	9574.631	-14.8	1.7	8		-7.0	1
14	5355	14.648	9598.648	-21.3	3.3	5			
15	5378	Aug 2.572	9617.572	-11.4	2.3	8		+8.2	1
16	5724	1913 Apr 7.822	9865.822	-22.5	3.7	8		-8.6	1
17	5779	May 7.767	9895.767	-20.9	8.6	9			
18	5873	Jun. 29.625	9948.625	-21.9	3.0	7		-0.6	1
19	5911	Jul 21.599	9970.599	-11.9	4.1	8		-18.1	1
20	5952	Aug 24.552	2420004.552	-16.8	6.5	8			
21	6265	1914 May 1.817	0254.817	-17.9	3.2	10		+33.1	1
22	6272	2.812	0255.812	-18.8	2.5	7			
			Mean	-14.2				Mean I.S. - 3.3	

This star does not appear to be variable in velocity.

HD 143807

Coronae Borealis  $\alpha = 15^h 57^m 26^s$

$\delta = +30^\circ 8'$

A0 II-III

1 2530 1909 May 27.727 2418454.727 -21.6  $\pm 3.4$  8

B

I.S. faint

I.S. faint

2	2534	28.685	8455.685	-33.5	±5.1	6.5	B
3	2546	31.703	8458.703	-13.5	3.2	6	B
4	2551	Jun 5.723	8463.723	+ 6.4	5.7	9	B
5	2566	11.688	8469.688	-26.8	4.9	8	B
6	2574	13.672	8471.672	-24.0	4.7	8	B
7	2577	15.672	8473.672	-28.2	7.7	8	B
8	2597	19.652	8477.652	- 4.9	4.4	8	B
9	2609	21.597	8479.597	-16.2	4.4	5	B
10	2611	22.681	8480.681	-19.1	7.1	7	B
11	2616	29.639	8487.639	-16.3	2.3	9	B
12	2623	30.644	8488.644	-11.2	3.6	8	B
13	2630	Jul 1.692	8489.692	- 8.9	2.9	6	B
14	2635	3.655	8491.655	-20.2	5.2	8	B
15	2638	4.615	8492.615	-15.7	2.9	6	B
16	2645	5.628	8493.628	+10.4	5.5	6	B
17	2651	6.668	8494.668	-13.0	3.4	10	B
18	2656	7.647	8495.647	-16.5	2.0	7	B
19	2664	8.608	8496.608	-19.6	6.4	6	B
20	2672	9.641	8497.641	-20.8	6.9	11	B
21	2683	17.583	8505.533	-18.0	3.9	10	B
22	2686	17.647	8505.647	-18.3	2.3	10	B
23	2688	17.719	8505.719	-14.2	1.7	7	B
24	2699	19.586	8507.586	-15.2	2.1	10	B

25	2704	19.713	8507.713	-25.2	±3.4	9	B
26	2710	20.612	8508.612	-23.9	5.7	7	B
27	2714	24.599	8512.599	-12.5	6.1	8	B
28	2719	25.594	8513.594	-12.6	2.9	8	B
29	2721	25.704	8513.704	-35.7	8.4	5	B
30	2734	28.573	8516.573	-26.1	1.3	12	B mean of 2
31	2739	Aug 1.563	8520.563	-20.1	3.2	5	B
32	2741	1.664	8520.664	-34.4	1.3	2	B underexposed
33	2747	2.568	8521.568	-14.7	2.4	7	B
34	2749	2.665	8521.665	-21.5	0.8	2	B underexposed
35	2756	3.592	8522.592	-15.7	4.3	6	B
36	2758	3.670	8522.670	-20.7	1.5	11	B
37	2764	4.611	8523.611	-12.6	2.1	7	B
38	2765	4.640	8523.640	-27.2	1.2	4	B
39	2768	6.561	8525.561	-26.6	1.5	8	B
40	2770	6.644	8525.644	-25.2	5.1	3	B weak
41	2778	7.622	8526.622	-15.4	1.0	4	B
42	2777	7.659	8526.659	-23.1	2.4	2	B fogged by development
43	2783	8.574	8527.574	-9.5	4.8	3	B
44	2784	8.626	8527.626	-30.6	4.7	2	B weak
45	3506	1910 Apr 10.811	8772.811	-20.1	1.5	8	D
46	3557	May 12.656	8804.656	-22.7	3.8	4	B
47	3559	12.727	8804.727	-20.6	4.2	4	B

48	3562	15.638	8807.638	-14.1	+1.6	5	B
49	3564	15.692	8807.692	-16.2	2.3	4	B
50	3566	15.756	8807.756	-15.1	4.5	5	B
51	3571	18.723	8810.723	-19.5	5.4	9	D
52	3576	27.728	8819.728	-16.7	4.3	7	D
53	4291	1911 Apr 10.761	9137.761	-21.5	2.2	8	D
54	5148	1912 Mar 30.794	9492.794	-14.7	5.4	8	D
55	5193	Apr 20.699	9513.699	-15.2	1.0	10	D
56	5213	24.769	9517.769	-16.7	1.3	8	D
57	5218	27.675	9520.675	-26.0	2.8	5	D
58	5227	May 4.710	9527.710	-21.3	1.9	8	D
59	5237	9.815	9532.815	-15.7	1.9	11	D
60	5241	10.666	9533.666	-38.1	9.7	3.5	D
61	5259	19.649	9542.649	-1.7	2.3	4	D underexposed
62	5264	22.695	9545.695	-24.8		2	D underexposed one line only
63	5269	24.647	9547.647	-3.0	0.5	3.5	D underexposed
64	5272	26.635	9549.635	-17.3	1.1	4	D
65	5281	30.763	9553.763	-26.1	1.1	7	D
66	5292	Jun 4.653	9558.653	-25.3	5.9	8	D
67	5328	20.662	9574.662	-12.1	2.0	9	D
68	5389	Aug 10.542	9525.542	-20.6	4.6	10	D
69	5404	17.547	9632.547	-13.5	3.9	9	D
70	5409	24.531	9639.531	-22.7	5.2	7	D
71	5685	1913 Mar 11.797	9838.797	-19.3	1.7	9	D

This star was announced as a spectroscopic binary by Schlesinger (Publ. A.O. I, 121, 1909). Subsequent observations left the issue somewhat in doubt. The first page of an unpublished manuscript by Schlesinger on Cr B still exists and in it Schlesinger states "The plates subsequently secured have not shown a much greater range in velocity than the first ones; it is accordingly desirable to examine the material in detail and to see whether observations should be continued." This star is a sharp-lined A0 star and the possibility that it is a binary is of considerable interest. Observations have been continued at Allegheny to investigate the question of long-term variability, since two stars with similar spectra,  $\alpha$  Gem and  $\epsilon$  Vir A, have periods of 12.4 and 13.6 years respectively. Also if the velocities of 1909 are plotted as 10-day means then a variation with a period of about 55 days is apparent. Further observations will be necessary to confirm this.

75	HD 144206	$\nu$ Herculis	$\alpha = 15^h 59^m 41^s$	$\delta = +46^\circ 19'$	Ap
1	3597	1910 Jun 19.594	2418842.594 + 4.6	$\pm 3.0$ 9.5	D
2	5830	1913 Jun 5.708	19924.708 + 7.0	1.2 12	D
3	5851	13.639	19932.639 + 1.6	1.5 14	D
4	6291	1914 May 15.816	20268.816 + 1.4	7.5 7	D
5	6317	20.814	20273.814 + 7.4	2.5 5	D
Mean + 4.1					

76	HD 148112	$\omega$ Herculis	$\alpha = 16^h 20^m 48^s$	$\delta = +14^\circ 16'$	Ap
1	2474	1909 Apr 15.799	2418412.799 +14.2	$\pm 4.1$ 10	
2	2548	May 31.745	8458.745 - 5.0	1.3 8.5	
3	2586	Jun 16.710	8474.710 +12.8	3.4 10	
4	2636	Jul 3.692	8491.692 - 9.8	4.0 12	
5	3496	1910 Apr 9.789	8771.789 -14.5	2.7 6	
6	3513	12.787	8774.787 -19.8	0.5 4	
7	3548	May 5.749	8797.749 - 4.8	1.8 10	
8	3580	28.698	8820.698 -10.1	3.0 6	
comparison weak on one side					

9	3585	Jun 7.633	8830.633	- 4.7	±2.9	6	comparison weak on one side
10	4293	1911 Apr 10.824	9137.824	+ 0.3	3.9	5	
11	4349	May 6.819	9163.819	-12.9	5.5	3	
12	4369	10.773	9167.773	+ 0.8	1.2	7	
13	4397	18.825	9175.825	-32.9	4.8	3	
14	4405	20.809	9177.809	- 9.8	3.7	7	
15	4416	24.748	9181.748	-16.0	1.9	7	
16	4432	26.797	9183.797	- 2.9	2.3	4	
17	4439	27.756	9184.756	<u>-11.6</u>	3.0	14	
Mean - 5.5							

It is unlikely that this star is a spectroscopic binary.

95

77	HD 148367	v Ophiuchi		$\alpha = 16^h 22^m 24^s$	$\delta = -8^\circ 9'$	Am	
1	3600	1910 Jun	20.648	2418843.648	-32.8	$\pm 3.2$ 11	Fogged
2	5826	1913 Jun	4.686	9923.686	-28.9	1.2 22	
3	5844		11.677	9930.677	-30.7	2.3 22	
4	6276	1914 May	8.827	2420261.827	-24.4	2.9 23	

Spectroscopic binary (Gutman, Publ. D.A.O. 12, 391, 1966).

78	HD 148857	$\lambda$ Ophiuchi	$\alpha = 16^{\text{h}}25^{\text{m}}52^{\text{s}}$	$\delta = +2^{\circ}12'$	A1V
1	4340	1911 May 5.771	2419162.771	-19.2 ±4.2	9 J

2	4370	10.806	9167.806	-18.8	±2.2	7	J
3	4417	24.781	9181.781	-18.2	2.5	7	J
4	4424	25.725	9182.725	-49.8	3.7	8	J
5	4448	29.701	9186.701	-23.7	2.5	6	J
6	4457	Jun 1.726	9189.726	-19.7	1.4	11	J
7	4483	3.714	9199.714	-14.1	3.4	9	J
8	4468	8.730	9196.730	-10.2	0.6	5	J
9	4476	10.704	9198.704	-22.1	1.7	9	J
10	4488	14.710	9202.710	-22.8	3.8	6	J
11	4492	15.725	9203.725	-13.5	3.1	16	J
12	4518	22.670	9210.670	- 7.7	2.3	5	J
13	4548	30.652	9218.652	-31.0	9.5	4	J
14	5195	1912 Apr 20.768	9513.768	-28.6	8.0	5	J
15	5244	May 10.775	9533.775	-24.2	1.9	13	J
16	5250	13.801	9536.801	-18.2	2.8	21	J
17	5271	24.766	9547.766	- 6.3	2.5	14	J
18	5288	Jun 1.725	9555.725	-53.8	3.9	8	J
19	5299	5.691	9559.691	-26.5	3.3	13	J
20	5310	8.702	9562.702	-10.6	1.9	15	J
21	5317	10.662	9564.662	-21.1	2.7	12	J
22	5333	28.673	9582.673	-14.0	4.3	8	J
23	5340	Jul 5.674	9589.674	-19.7	3.4	16	J
24	5349	8.642	9592.642	-22.5	4.0	10	J

25	5377	Aug 1.585	9616.585	-21.8	±2.6	9	J
26	5394	12.577	9627.577	-30.3	1.9	8	J
27	5730	1913 Apr 16.837	9874.837	-23.3	2.4	14	J
28	5763	30.804	9888.804	- 8.0	4.5	11	J
29	5768	May 1.795	9889.795	-30.7	6.1	7	J
30	5780	7.802	9895.802	-11.3	3.4	9	J
31	5784	8.772	9896.772	-20.2	3.9	16	J
32	5791	10.755	9898.755	-32.8	4.8	12	J
33	5796	11.786	9899.786	-21.0	4.0	18	J
34	5800	18.743	9906.743	- 9.5	3.9	9	J
35	5847	Jun 12.609	9931.609	-42.4	2.7	5	J
36	5864	18.591	9937.591	-15.1	7.2	5	J spectrum weak
37	5865	19.614	9938.614	-25.7	5.7	6	J

The range observed here (-6 to -54) is comparable to the published range of +8 to -40. This star can be considered to be a probable spectroscopic binary.

79	HD 153808	$\epsilon$ Herculis	$\alpha = 16^h56^m28^s$	$\delta = +31^{\circ}4'$	AOV
1	6776	1915 Jul 30.595	2420709.595	-99.4	$\pm 2.6$ 8
2	6780	Aug 12.597	0722.597	-41.6	1.6 9
3	6786	16.565	0726.565	-35.5	4.5 11
4	6791	31.572	0741.572	-81.9	5.6 6
5	6798	Sep 7.553	0748.553	-12.7	2.3 8
6	6805	10.535	0751.535	- 5.2	7.2 7
					D mean of 2
					D
					D
					D
					D
					D

7	5415	Sep	4.663	9650.663	-29.6	*2.3	2.5	J	
8	5424		7.684	9653.684	-67.1	2.9	6.5	J	
9	5434		9.658	9655.658	-50.1	5.4	7	J	
10	5439		11.674	9657.674	-59.0	8.2	3.5	J	
11	5462		27.589	9673.589	-22.8	3.9	7.5	J	
12	5474		30.624	9676.624	+20.8	5.3	7.5	J	
13	5488	Oct	4.580	9680.580	+31.1	5.3	4.5	J	poor
14	5494		5.605	9681.605	+26.5	4.9	4	J	
15	5501		11.549	9687.549	- 5.7	2.5	8.5	J	
16	5512		16.547	9692.547	+23.2	10.0	4	J	
17	5525		26.529	9702.529	-11.5	4.4	5	J	comparison weak
18	5529		27.489	9703.489	+ 0.3	4.6	4	J	
19	5538		30.573	9706.573	- 2.3	5.7	3	J	weak
20	5550	Nov	8.511	9715.511	-18.5	13.7	5	J	
21	5863	1913 Jun	17.791	9936.791	-36.6	7.4	3	J	
22	5872		28.778	9947.778	-39.3	5.0	6	J	
23	5897	Ju1	15.726	9964.726	+24.0	7.5	2.5	J	
24	5928	Aug	2.690	9982.690	-11.7	4.6	9.5	J	
25	5934		5.691	9985.691	-55.6	5.7	8	J	
26	5980	Sep	3.593	2420014.593	-45.9	6.2	4.5	J	
27	5983		5.588	0016.588	-44.5	2.6	4	J	
28	6408	1914 Ju1	20.667	0334.667	-34.0	4.2	5.5	J	
29	6454	Aug	18.635	0363.635	-54.9	6.2	5	J	mean of 2, measure comparison weak on one side

7	6809	13.580	0754.580	-65.0	±4.5	8			D
8	6810	15.535	0756.535	-9.0	1.4	8			D

These velocities fit the orbit of Baker (Publ. A.O. 2, 17, 1910). Blending with the secondary is evident for plate 6805.

0	HD 154494	60 Herculis	$\alpha = 17^h 0^m 44^s$	$\delta = +12^\circ 53'$	A3IV
1	3593 1910 Jun	8.656 2418831.656	+2.6	±3.5	7 J
2	3601	20.697 8843.697	-11.2	4.5	13 J
3	5362 1912 Jul	22.649 9606.649	-6.9	2.6	10 J
4	5801 1913 May	18.809 9906.809	+13.2	2.6	15 J
5	5887 1913 Jul	10.663 9959.663	-3.2	4.5	15 J
		Mean	-0.8		

1	HD 156247	$\alpha = 17^h 11^m 27^s$	$\delta = +1^\circ 19'$	B5V
1	2437 1909 Mar	22.858 2418388.858	+44.1	mean c.f. 2 one line only-blended

2	HD 156633	68 Herculis	$\alpha = 17^h 13^m 38^s$	$\delta = +33^\circ 12'$	B3 III
1	3641 1910 Jul	13.664 2418866.664	-90.8	±6.4	5 B
2	6705 1915 Jun	4.778 2420653.778	-45.9	4.0	12 H,D mean of 2
3	6710	5.777 0654.777	-0.8	4.3	10 H.D 3
4	6713	9.639 0658.639	+56.6	4.4	13 1 -7.5 2 H,D 2
5	6718	11.689 0660.689	+52.9	3.2	12 D
6	6725	17.643 0666.643	+76.2	3.4	13 +3.2 2 H,D 2

7	6728	19.639	0668.639	+77.7	±3.4	13	H,D	mean of 2
8	6732	20.606	0669.606	-105.1	4.4	15	H,D	2
9	6737	23.612	0672.612	+64.0	3.5	11	H,D	2
10	6753	Jul 3.625	0682.625	+20.3	24.2	3	D	
11	6755	8.600	0687.600	- 1.0	3.9	8	H,D	2
12	6761	13.640	0692.640	-67.0	5.0	12	H,D	2
13	6766	19.592	0698.592	-112.1	4.6	11	H,D	2
14	6767	21.603	0700.603	-108.7	2.8	11	H,D	2
							1	
							Mean I.S. = 8.4	

These points fit the orbit of Baker (Publ. A.O. 1, 77, 1909),  $T = 2418125.80$ ,  $P = 2.051027$ .

83	HD 157193	70 Herculis	$\alpha = 17^h 16^m 47^s$	$\delta = +24^\circ 36'$	A1V
1	2605 1909 Jun 20.693	2418478.693	-10.1	±4.6	5
2	3587 1910 Jun 7.706	3830.706	-10.4	4.7	4
3	3692 Aug 1.564	3885.564	-44.2		2
4	4728 1911 Aug 22.585	9271.585	-23.1	5.6	7
5	5891 1913 Jul 11.682	9960.682	-34.2	6.0	5
6	6385 1914 Jul 2.711	2420316.711	-17.1	1.3	10
J spectrum weak					
J 1 line only					

The range of these velocities together with the published velocities is +16 km/sec. to -44 km/sec. This star is a possible spectroscopic binary.

84	HD 162579	$\alpha$ Ophiuchi	$\alpha = 17^h 30^m 18^s$	$\delta = +12^\circ 38'$	A5 III
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1	2547	1909 May	31.724	2418458.724	+17.6	±6.2	5	B
2	2552	Jun	5.742	8463.742	+21.2	3.6	7	B
3	2673	Jul	9.667	8497.667	+31.7	3.7	8	B
4	2702		19.628	8507.628	+12.5	2.9	7	B
5	2728		27.692	8515.692	+21.8	4.8	7	B
6	2729		27.706	8515.706	+9.1	3.0	6	B

Astrometric binary, period 8  $\frac{1}{2}$  5 (Lippencott and Wagman, A.J. 71, 122, 1966.)

5	HD 162579	30 Draco	$\alpha = 17^h 46^m 41^s$	$\delta = +50^\circ 48'$	A2		
1	3623	1910 Jun 28.641	2418851.641	-59.2	±2.6	7.5	D
2	5833	1913 Jun 6.705	9925.705	-72.6	1.3	6	D underexposed
3	5855	14.634	9933.634	-45.9	3.3	6	D
4	6297	1914 May 16.752	2420269.752	-58.7	3.6	6	D

The range of these velocities together with the published velocities is -33 km/sec. to -73 km/sec. This star is therefore a possible spectroscopic binary.

6	HD 164284	66 Ophiuchi	$\alpha = 17^{\text{h}}55^{\text{m}}19^{\text{s}}$	$\delta = +4^{\circ}22'$	B2 Ve
1	2540 1909 May	2418456.760 + 0.4	$\pm 3.9$	4	J
2	2606 Jun 20.721	8478.721 - 8.1	10.3	2	J
3	2997 Sep 20.582	8570.582 - 3.4	8.5	3	J
4	4721 1911 Aug 21.565	9270.565 -19.8	16.1	3	J
5	5960 1913 Aug 27.564	2420007.564 -16.8	4.4	4	J I.S. is 2 lines

The published range is +10 km/sec. to -66 km/sec. This star is a possible spectrographic binary.

87 HD 166014      o Herculis       $\alpha = 18^h 3^m 38^s$        $\delta = -28^\circ 45'$       B9V

1	5214	1912 Apr	24.807	2419517.807	-10.6	$\pm 4.1$	4
2	5238	May	9.847	9532.847	-43.6	6.1	5
3	5256		17.822	9540.822	-17.9	5.6	3
4	5266		22.759	9545.759	-53.1	10.2	4
5	5294	Jun	4.716	9588.716	-24.7	6.4	3
6	5307		7.812	9591.812	-19.3	6.4	4
7	5334		28.741	9612.741	-18.1	2.2	6
8	5379	Aug	2.610	9617.610	-23.0	6.2	6
9	5412		26.566	9641.566	-40.7	1.8	5
10	5797	1913 May	11.821	9839.821	-28.1	1.2	3
11	5824	Jun	2.792	9921.792	-8.2	12.1	2
12	5846		11.819	9930.819	-39.7	2.1	5
13	6368	1914 Jun	12.818	2420296.818	-16.4	3.7	2.5

broken & out of focus  
2 lines only

The extreme velocities have large probable error hence it is unlikely that this star has variable velocity.

88	HD 169986	59 Serpentis	$\alpha = 18^{\text{h}}22^{\text{m}}06^{\text{s}}$	$\delta = +00^{\circ}08'$	G0+A0			
1	3588	1910 Jun	7.738	2418830.738	-15.5	$\pm 2.2$	19	J
2	3595		8.742	8831.742	-22.7	3.8	9	J
3	3602		20.746	8843.746	+14.2	5.4	2	J spectrum very weak

4	3610	24.710	8847.710	-23.9	+5.3	11	J	
5	3616	25.689	8848.689	-37.4	3.9	5	J	
6	3625	28.720	8851.720	-39.5	7.6	4	J	spectrum weak
7	3653	Jul 20.665	8873.665	-34.5	4.4	8	J	spectrum weak
8	3659	24.621	8877.621	-29.5	2.1	15	J	
9	3664	26.576	8879.576	-31.8	4.3	13	J	
10	3670	28.576	8881.576	-25.4	3.4	18	J	numerous lines
11	3697	Aug 5.603	8889.603	-12.3	7.0	4	J	
12	3710	8.569	8892.569	-36.0	2.6	14	J	
13	3722	12.582	8896.582	- 4.1	3.5	5	J	spectrum weak
14	4341	1911 May 5.810	9162.810	-11.1	2.5	20	J	
15	4406	20.842	9177.842	- 8.3	2.9	17	J	
16	4418	24.819	9181.819	+14.8	4.9	12	J	spectrum weak
17	4425	25.769	9182.769	- 5.9	3.7	10	J	
18	4440	27.790	9184.790	-28.2	7.7	8	J	spectrum very weak
19	4449	29. -	-	-	-	-		plate missing
20	4451	30.802	9187.802	- 8.7	9.5	5	J	spectrum very weak
21	4458	Jun 1.775	9189.775	- 5.3	3.1	23	J	
22	4463	3.759	9191.759	-19.5	5.4	13	J	spectrum weak
23	4477	10.746	9198.746	-21.1	5.6	16	J	
24	4481	12.714	9200.714	+ 3.2	4.5	9	J	
25	4502	19.722	9207.722	-14.4	2.9	14	J	
26	4507	20.731	9208.731	-28.2	5.2	8	J	

27	4512	21.706	9209.706	-13.4	*3.4	17	J	
28	4519	22.718	9210.718	-15.1	3.0	10	J	
29	4526	23.758	9211.758	-13.1	6.8	11	J	spectrum poor
30	4537	28.740	9216.740	-25.1	2.7	14	J	
31	4542	29.735	9217.735	-21.0	1.4	15	J	
32	4556	Jul 1.680	9219.680	-18.4	3.8	12	J	
33	4563	2.678	9220.678	- 0.5	5.1	9	J	lines ragged
34	4570	3.742	9221.742	-29.1	5.1	12	J	
35	4575	4.657	9222.657	-23.6	8.5	6	J	spectrum weak
36	4580	5.665	9223.665	-31.3	3.6	10	J	spectrum weak
37	4589	8.707	9226.707	-34.3	5.0	20	J	
38	4594	9.686	9227.686	-13.5	2.9	18	J	
39	4607	14.698	9232.698	-11.8	4.5	13	J	
40	4611	15.633	9233.633	-19.1	2.8	14	J	
41	4617	17.666	9235.666	- 6.6	6.3	6	J	spectrum very weak
42	4623	22.631	9240.631	-11.5	3.2	20	J	
43	4632	26.664	9244.664	-20.7	2.8	17	J	
44	4642	28.658	9246.658	-18.7	5.3	8	J	
45	4649	30.624	9248.624	-17.2	4.9	8	J	
46	4656	Aug 6.649	9255.649	-10.6	9.4	6	J	
47	4666	9.633	9258.633	-14.5	3.7	12	J	
48	4673	10.603	9259.603	-26.5	4.9	13	J	
49	4679	11.613	9260.613	-23.2	4.4	12	J	

50	4697	16.619	9265.619	-36.9	+3.3	10	J
51	4714	20.562	9269.562	-35.0	3.3	12	J
52	6282	1914 May	9.808	2420262.808	-4.0	8.6	13 J spectrum weak

This star is a spectroscopic triple system, orbit by Tilley (Ap. J. 98, 347, 1943). The short period of 1.85 days represents a double line A0 A0 binary which Jordan apparently measured blended. These velocities, therefore, have significance only in terms of the 386 day period.

	HD 170000	$\phi$ Draconis	$\alpha = 18^h 22^m 12^s$	$\delta = +71^\circ 17'$	A0si
1	4471	1911 Jun 9.719	2419197.719	-21.7	+2.4 9 J
2	4482	12.765	9200.765	-41.0	3.1 10 J
3	4497	18.760	9206.760	-59.2	6.2 6 J
4	4559	Jul 1.783	9219.783	-46.7	8.0 5 J
5	5335	1912 Jun 28.804	9582.804	-33.4	2.3 12 J
6	5840	1913 Jun 10.6"2	9929.672	-14.5	3.7 12 J
7	5852	13.703	9932.703	-13.7	3.2 8 J
8	5856	14.678	9933.678	-15.0	4.1 7 J
9	5860	15.860	9934.860	- 9.2	1.7 7.5 J
10	5866	21.674	9940.674	- 6.0	2.8 7.5 J
11	5892	Jul 12.622	9961.622	-26.2	5.4 5 J
12	5933	Aug 5.627	9985.627	-31.8	5.4 10 J
13	5937	9.567	9989.567	-26.5	3.8 7 J overexposed
14	5942	19.566	9999.566	-11.3	2.9 8 J
15	5967	30.565	2420010.565	-30.2	2.9 8 J

16	5987	Sep 6.537	0017.537	-18.5	±2.1	5	J
17	5992	8.576	0019.576	-27.1	3.1	14	J
18	6007	23.533	0034.533	-18.7	1.9	8	J
19	6298	1914 May 16.806	0269.806	-31.0	4.3	8	J
20	6307	18.795	0271.795	-31.4	2.8	13	J
21	6312	19.729	0272.729	- 9.0	2.5	7	J
22	6329	25.830	0278.830	-24.3	2.5	7.5	J
23	6355	Jun 6.735	0290.735	-15.4	4.9	10	J
24	6373	16.708	0300.708	- 8.6	2.4	11	J strong exposure
25	6379	23.651	0307.651	-20.5	3.1	6.5	J
26	6396	Jul 11.632	0325.632	-15.9	3.2	12	J
27	6401	15.732	0329.732	- 0.9	2.6	12	J
28	6438	Aug 12.583	0357.582	-70.2	5.8	10	J
29	6441	13.598	0358.598	-53.9	3.4	7	J
30	6462	23.604	0368.604	-37.7	4.9	11	J
31	6463	26.567	0371.567	-38.3	6.1	11	J
32	6469	31.578	0376.578	-31.0	2.3	12	J
33	6477	Sep 13.521	0389.521	-30.2	2.7	9	J
34	6485	15.554	0391.554	-14.6	4.4	9	J
35	6490	18.536	0394.536	-10.8	2.3	8	J
36	6492	20.537	0396.537	-28.5	3.4	11	J
37	6496	21.533	0397.533	-27.0	2.0	14	J
38	6501	22.548	0398.548	-23.4	3.8	5.5	J

39 6515' 29.503 '0405.503 -18.5 ± 4.8 '9

All published velocities as well as these fit a period of 127.8 days. Preliminary elements are

$$\begin{aligned} P &= 127^d.85 \\ T_0 &= 2413823.7 \\ \phi &= \text{periastron } 61.0^\circ \\ k &= 30 \text{ km/sec.} \\ e &= 0.60 \\ \omega &= 120^\circ \\ \gamma &= -25.5 \text{ km/sec.} \end{aligned}$$

An interesting feature is the large scatter about this curve which implies a short period. Several persons have noted doubling of lines in the spectrum (see Hnatek, A.N. 197, 185, 1913). There is a suggestion also, of a much longer period. The star is a visual binary (ADS 11311) and is presently closing in to periastron. It is unlikely that this can account for the apparent long period variation.

90	HD 172167	$\alpha$ Lyrae	$\alpha = 18^h 33^m 33^s$	$\delta = +38^\circ 41'$	A0V
1	2620	1909 Jun 29.833	2418487.833	-13.8 ± 1.4	4
2	2639	Ju1 4.646	8492.646	-14.6	1.3 12
3	2640	4.661	8492.661	-15.3	1.2 14
4	2675	9.764	8497.764	-17.3	1.5 12
5	2715	24.721	8512.721	-22.1	1.0 13
6	2716	24.728	8512.728	-18.2	1.5 13
7	2776	Aug 7.560	8526.560	-10.1	1.4 11
8	2779	7.686	8526.686	-12.5	0.9 16
9	2781	7.781	8526.781	-7.6	2.0 8
10	2792	10.622	8529.622	-16.6	1.5 11
11	2793	10.631	8529.631	-14.5	1.3 13
12	2803	18.561	8537.561	-15.7	0.8 14
13	2804	18.571	8537.571	-13.9	1.2 15
14	2822	21.732	8540.732	-20.0	1.2 19
15	2823	21.746	8540.746	-18.4	0.9 17

mean of 2

mean of 2

mean of 2

underexposed -  
reject

mean of 2

mean of 2

mean of 2

overexposed

16	2826	22.543	8541.543	-15.5	±0.9	10
17	2827	22.547	8541.547	-15.7	0.9	12
18	2838	24.542	8543.542	-14.7	1.3	13
19	2839	24.551	8543.551	-16.5	1.2	9
20	2863	28.567	8547.567	-16.6	0.9	14
21	2864	28.574	8547.574	-17.3	1.4	11
22	2874	30.555	8549.555	-15.9	0.8	13
23	2875	30.565	8549.565	-14.4	0.9	12
24	2879	31.640	8550.640	-18.3	1.9	10
25	2880	31.643	8550.643	-18.2	0.7	9
26	2884	Sep 1.658	8551.658	-9.6	1.7	11
27	2885	1.666	8551.666	-13.8	1.8	14
28	2896	5.516	8555.516	-17.0	0.8	14
29	2897	5.522	8555.522	-12.1	0.6	14
30	2906	7.519	8557.519	-13.4	1.3	7
31	2907	7.524	8557.524	-15.9	2.0	7
32	2918	8.581	8558.581	-16.6	1.8	6
33	2919	8.596	8558.596	-12.4	2.5	8

mean of 2

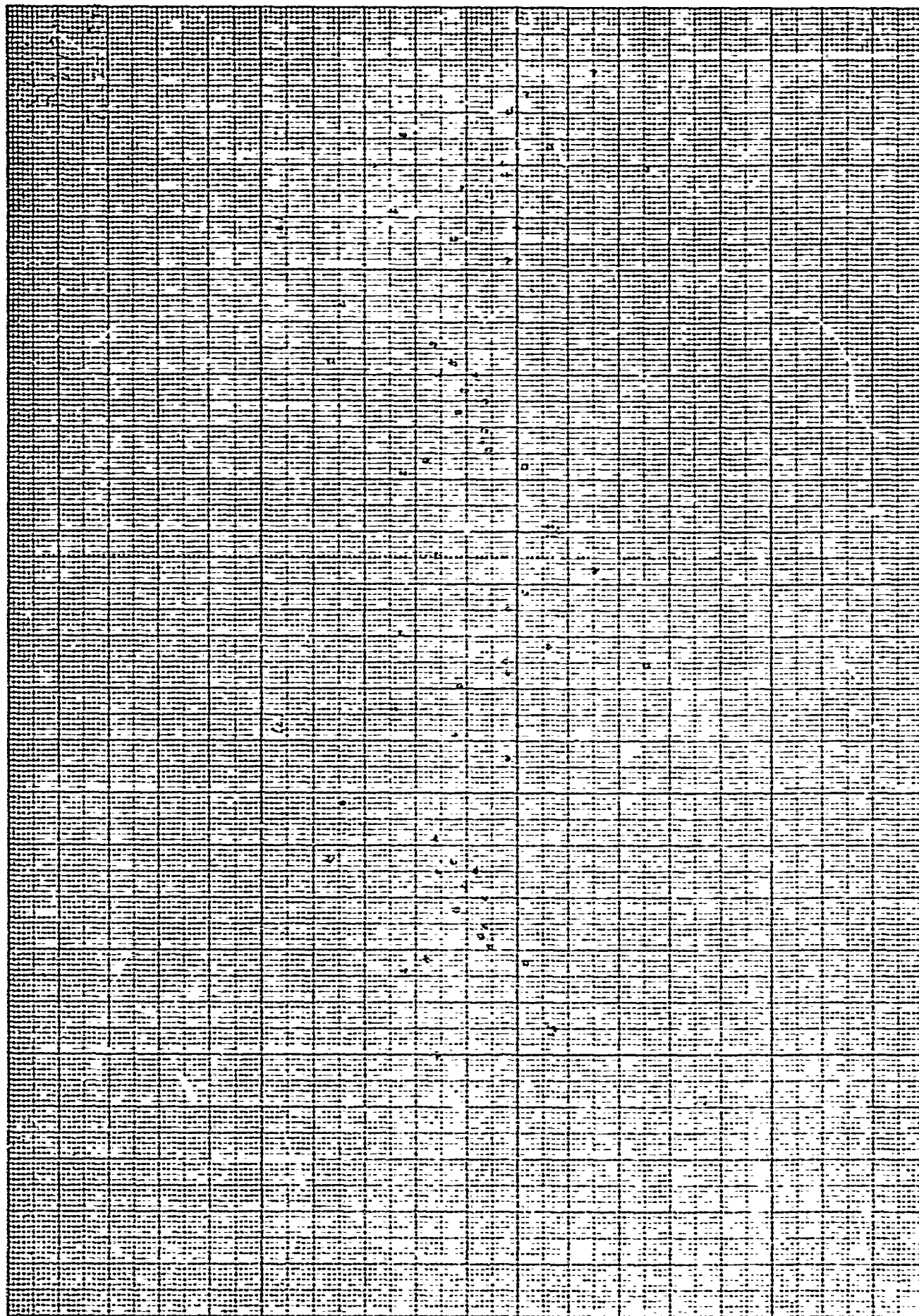
2

overexposed; poor  
guiding  
overexposed

A periodic variation in radial velocity of 0.19 days was found by Belopolsky (z.f. Astroph. 2, 245, 1931). This was subsequently emphatically disavowed by Neubauer (L.O.B. 17, 109, 193) who considered no variation existed greater than 0.2 km/sec., even though some of his observations show an apparent variation of the proper parameters. Figure 2 shows a plot of these velocities on a trial period of 0.1903 days. There is considerable scatter, however, a periodic variation appears evident that might well be associated with large scale atmospheric motion. The fact that the variation is still apparent after a total of more than 370 cycles would seem to be of significance. However, almost 50% of the observations lie within p.e. 1.5 km/sec., which is close to the mean p.e. per plate. We feel that a careful series of observations should be obtained to resolve this issue.

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HD 173648		Lyrae		$\alpha = 18^h 41^m 20^s$	$\delta = +37^\circ 30'$	Am
1	6706	1915 Jun	4.853	2420653.853	-54.2	$\pm 1.3$ 41
2	6722		12.694	0661.694	-79.0	1.8 14
3	6727		17.839	0666.839	-50.5	1.2 37
4	6729		19.724	0668.724	+14.4	0.9 47
5	6733		20.666	0669.666	-45.5	1.3 45
6	6738		23.672	0672.672	+26.4	0.8 45
7	6741		24.578	0673.578	-24.2	2.0 25
8	6742		25.659	0674.659	-70.8	2.7 24
9	6744		26.631	0675.631	-32.4	0.7 47
10	6750	Jul	2.634	0681.634	+10.9	1.1 43
11	6759		11.590	0690.590	- 5.5	1.1 40
12	6768		21.658	0700.658	-72.7	1.3 47
13	6771		22.588	0701.588	-20.5	1.5 37

comparison weak

weak

out of focus

comparison very weak

These velocities agree with the orbit of Jordan (Publ. A.O. 1, 115, 1909).

HD 173880		111 Herculis		$\alpha = 18^h 42^m 36^s$	$\delta = +18^\circ 4'$	A3V
1	2625	1909 Jun	30.703	2418488.703	-44.6	$\pm 1.9$ 17
2	2996	Sep	20.533	8570.533	-58.3	1.0 24
3	3024		27.544	8577.544	-55.5	1.4 14
4	3033		28.517	8578.517	-41.3	2.4 17
5	3043	Oct	3.581	8583.581	-54.3	1.1 18

mean of 2

mean of 2

mean of 2

D

D

6	3045	4.509	8584.509	-49.7	*1.8	17.5	D
7	3057	5.552	8535.552	-54.2	1.1	13.5	D
8	3110	12.516	8592.516	-29.3	4.5	14.5	D
9	3611	1910 Jun 24.775	8847.775	-49.7	2.4	15.5	D
10	3617	25.731	8848.731	-48.8	1.5	23	D
11	3621B	-	-	-	-	-	- reject
12	3624	28.676	8851.676	-53.3	1.9	18	D
13	3630	Jul 4.682	8857.682	-49.9	2.8	16.5	D
14	3634	7.643	8860.643	-40.5	2.1	12	D
15	3638	8.717	8861.717	-47.8	2.3	9.5	D
16	3648	19.753	8872.753	-45.8	2.5	18	D
17	3654	23.597	8876.597	-49.9	3.1	12.5	D
18	3665	26.633	8879.633	-50.2	1.6	22	D
19	3669A	27. -	-	-	-	-	- reject
20	3671	28.618	8881.618	-47.2	1.1	15.5	D
21	3686	31.580	8884.580	-41.2	1.7	15.5	D
22	3693	Aug 4.718	8888.718	-47.4	2.1	8	D
23	3705	6.604	8890.604	-46.7	1.9	20.5	D
24	3711	8.617	8892.617	-49.4	1.8	19	D
25	3715	11.606	8895.606	-48.7	2.0	18.5	D
26	3729	13.565	8897.565	-48.5	1.4	15.5	D
27	3735	15.603	8899.603	-51.6	2.6	16	D
28	3736	17.569	8901.569	-46.8	2.7	16.5	D

29	3738	19.552	8903.552	-47.7	1.0	26.5	D
30	3744	20.563	8904.563	-49.0	2.0	11.5	D
31	3749	26.542	8910.542	-50.6	1.9	17	D
32	3758	27.547	8911.547	-47.3	3.3	15	D
33	3765	28.568	8912.568	-50.7	3.5	8	D
34	3772	29.558	8913.558	-33.5	3.6	14	D
35	3777	30.602	8914.602	-38.8	3.6	12.5	D
36	3779C	-	-	-	-	-	- reject
37	3779	Sep 6.567	8921.567	-50.9	3.2	12	D
38	3786	7.542	8922.542	-52.1	2.0	8.5	D
39	3792	9.587	8924.587	-53.7	3.5	8.5	D
40	3793	10.572	8925.572	-36.7	5.1	5	D
41	3795	11.582	8926.582	-55.2	2.5	10.5	D
42	3806	15.587	8930.587	-42.5	1.5	17	D focus poor
43	3813	16.566	8931.566	-53.0	1.6	15.5	D
44	3818	21.556	8936.556	-47.9	4.2	7.5	D
45	3826	22.545	8937.545	-54.8	3.3	13	D
46	3832	26.527	8941.527	-56.8	1.6	19.5	D
47	3839	28.548	8943.548	-56.2	2.3	14.5	D
48	3848	29.558	8944.558	-53.1	2.4	12.5	D
49	4018	Nov 8.473	8984.473	-52.6	1.6	14	D
50	4331	1911 May 4.821	9161.821	-52.0	1.8	17	D
51	4469	Jun 8.792	9196.792	-47.2	1.2	29	D seed 23

52	4699	Aug 18.590	9267.590	-47.4	±1.3	34	D	seed 23
53	4852	Oct 13.510	9323.510	-45.2	1.5	33	D	
54	4939	Nov 16.465	9357.465	-45.8	1.6	27	D	

This is a spectroscopic binary of low amplitude. A period of 130 days appears to satisfy these observations. Further observations will be necessary to confirm this.

93 HD 180163 n Lyrae  $\alpha = 19^h 10^m 21^s$   $\delta = +38^\circ 58'$  B21V

1	5267	1912 May 22.807	2419545.807	-13.7	±2.2	17	
2	5295	Jun 4.754	9558.754	-10.6	1.5	19	
3	5319	10.799	9564.799	-1.9	1.2	19	
4	5381	Aug 2.760	9617.760	-12.0	1.2	25	
5	5446	Sep 16.599	9662.599	-14.8	1.3	20	
6	6806	1915 Sep 10.590	2420751.590	<u>-11.0</u>	1.5	16	

Mean -10.7

94	HD 180554	1 Vulpeculae	$\alpha = 19^h 11^m 55^s$	$\delta = +21^\circ 13'$	B3IV					
1	2608	1909 Jun 20.822	2418478.822	-28.9	$\pm 3.6$	12	+ 73.7	2	J	mean of 2
2	2627	30.763	8488.763	-30.9	2.2	12			J	2
3	2742	Aug 1.704	8520.704	-36.3	2.6	8			J	2
4	2750	2.706	8521.706	-28.7	5.0	13			J	2
5	3589	1910 Jun 7.769	8830.769	-14.9	4.6	6			J	2
6	3991	Oct 30.517	8975.517	-39.0	11.6	3			J	
7	4001	31.483	8976.483	-50.5	5.2	10			J	

8	4019	Nov	8.510	8984.510	-17.9	+3.5	6	J
9	4037		20.481	8996.481	-30.2	3.1	7	J
10	4426	1911 May	25.806	9182.806	-33.8	3.4	7	J
11	4433		26.842	9183.842	-36.5	3.3	3	J
12	4452		30.856	9187.856	-12.4	9.3	6	J
13	4470	Jun	8.845	9196.845	+ 6.0	2.5	7	J
14	4484		12.843	9200.843	-27.6	2.7	10	J
15	4498		18.807	9206.807	-31.1	5.8	8	J
16	4513		21.744	9209.744	-10.8	8.7	4	J
17	4521		22.786	9210.786	-27.9	2.6	10	J
18	4527		23.812	9211.812	-36.3	8.5	6	J
19	4544		29.816	9217.816	-31.8	3.6	10	J
20	4558	Jul	1.755	9219.755	-29.4	3.3	7	J
21	4572		3.824	9221.824	-52.8	5.1	5	J
22	4600		12.712	9230.712	-24.4	2.1	9	J
23	4766	Sep	6.574	9286.574	- 4.4	7.0	9	J
24	4771		11.554	9291.554	-19.6	3.3	11	J
25	4831		30.499	9310.499	-17.7	5.7	9	J
26	4872	Oct	19.496	9329.496	-12.8	8.1	11	J
27	4893		26.503	9336.503	- 7.7	2.9	7	J
28	5296	1912 Jun	4.794	9558.794	-25.0	3.3	10	J
29	5325		13.811	9567.811	+10.2	2.2	4	J
30	5351	Jul	8.827	9592.827	-11.6	4.5	10	J

31	5360	16.803	9600.803	-11.5	*6.6	4	J
32	5384	Aug 4.781	9619.781	-60.3	3.7	6	J
33	5391	11.690	9626.690	-29.6	5.4	7	J
34	5396	13.648	9628.648	-33.7	3.9	7	J
35	5429	Sep 8.631	9654.631	-27.8	3.8	5	J
36	5437	10.636	9656.636	-44.8	3.3	4	J
37	5467	28.574	9674.574	-36.3	4.4	4	J
38	5493	Oct 5.556	9681.556	-16.9	2.9	11	J
39	5511	16.496	9692.496	-47.0	5.7	7	J
40	5524	26.478	9702.478	-18.4	4.8	13	J
41	5537	30.492	9706.492	-16.3	5.7	9	J
42	5810	1913 May 24.790	9912.790	-16.0	2.6	10	J
43	5828	Jun 4.841	9923.841	-12.1	2.3	8	J
44	5842	10.808	9929.808	-25.9	1.9	7	J
45	5858	14.806	9933.806	-24.8	5.5	4.5	J
46	5862	17.785	9936.785	-30.0	12.8	5	J
47	5889	Ju1 10.812	9959.812	-29.1	4.3	12	J
48	5896	15.670	9964.670	-24.3	3.1	8	J
49	5919	29.599	9978.599	-18.1	4.6	9	J
50	5943	Aug 19.616	9999.616	+11.4	4.5	7	J
51	5979	Sep 3.544	2420014.544	-20.1	5.1	4.5	J
52	6021	30.521	0041.521	- 7.0	3.7	13	J
53	6333	1914 May 26.767	0279.767	+11.0	6.1	4.5	J spectrum weak

54	6341	30.737	0283.737	-10.4	±6.4	4	J
55	6347	Jun 1.806	0285.806	-23.2	3.4	13	J
56	6356	6.798	0290.798	-19.1	6.5	8	J
57	6367	12.760	0296.760	-22.2	5.2	6	J
58	6374	16.752	0300.752	-44.3	4.2	10	J
59	6389	Jul 3.698	0317.698	-22.9	2.6	11	J
60	6395	10.746	0324.746	-32.0	7.2	5	J
61	6397	11.681	0325.681	-43.0	4.3	9	J
62	6402	15.783	0329.783	-49.3	4.1	8	J
63	6403	18.596	0332.596	-52.9	7.3	8	J
64	6407	20.612	0334.612	-43.6	4.3	10	J
65	6418	25.631	0339.631	-9.5	4.9	7	J
66	6422	26.614	0340.614	-40.9	1.5	6	J
67	6429	29.671	0343.671	-47.3	5.2	10.5	J
68	6433	30.670	0344.670	-33.0	4.6	11.5	J
69	6439	Aug 12.636	0357.636	-24.5	3.6	14	J
70	6442	13.628	0358.628	-24.2	4.3	13	J
71	6446	15.561	0360.561	-28.7	5.0	12	J
72	6452	17.590	0362.590	-18.6	3.7	13.5	J
73	6453	18.581	0363.581	-24.8	3.9	15	J
74	6455	19.658	0364.658	-29.7	0.9	8.5	J
75	6504	Sep 25.542	0401.542	-22.2	4.2	10	J
76	6509	28.535	0404.535	-42.4	3.9	13	J

comparison weak  
on pier side

77	6523	Oct 2.533	0408.533	-24.7	±4.9	12	J	
78	6692	1915 May	0628.859	-17.1	2.3	5.5	J	
79	6697	19.809	0637.809	-7.2	5.6	5	J	spectrum weak
80	6700	21.776	0639.776	-22.4	2.7	12	J	
81	6719	Jun 11.751	0660.751	-6.3	12.9	8.5	J	
82	6730	19.761	0668.761	-12.7	4.2	2	J	spectrum very weak
83	6734	20.727	0669.727	-35.8	6.8	13	J	
84	6743	25.736	0674.736	-29.6	5.1	12	J	comparison weak

Period about 240 days?

95 HD 182568 2 Cygni  $\alpha = 19^h 20^m 11^s$   $\delta = +29^\circ 26'$  B3IV

1	3603	1910 Jun 20.789	2418843.789	-9.9	±2.0	10	D	
2	4878	1911 Oct 20.521	9330.521	-22.0	2.0	7	D	

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96 HD 182640  $\delta$  Aquilae  $\alpha = 19^h 20^m 27^s$   $\delta = +02^\circ 55'$  F01V

1	515	1907 May 28.864	2417724.864	-21.8	±2.8	14	B	
2	516	28.889	7724.889	-20.5	2.3	8	B	
3	531	29.810	7725.810	-32.6	2.1	15	B	
4	532	29.846	7725.846	-29.7	2.9	15	B	
5	684	Jul 23.713	7780.713	-30.2	4.4	12	B	
6	753	Aug 13.719	7801.719	-29.4	2.6	18	B	

7	785	26.572	7814.572	-29.0	±1.8	13	B
8	786	26.601	7814.601	-27.5	3.2	19	B
9	789	28.717	7816.717	-25.0	4.2	19	B
10	796	30.719	7818.719	-26.1	3.1	8	B
11	803	31.756	7819.756	-29.5	3.4	13	B
12	804	31.785	7819.785	-31.3	2.9	17	B
13	808	Sep 1.577	7820.577				plate missing
14	810	5.599	7824.599				plate missing
15	819	6.653	7825.653	-28.2	2.6	16	comp. one side only
16	820	6.700	7825.700	-39.1	1.7	18	B
17	837	12.632	7831.632	-33.3	2.3	18	B
18	838	12.686	7831.686	-40.9	4.1	14	B
19	868	16.622	7835.622	-35.4	2.3	18	B
20	878	23.544	7842.544	-26.2	2.3	17	B
21	879	23.580	7842.580	-45.1	3.9	8	U
22	880	23.593	7842.593	-44.7	1.6	5	F
23	881	23.604	7842.604	-45.1	3.7	4	F
24	901	Oct 5.560	7854.560	-33.0	2.3	20	B
25	902	5.603	7854.603	-34.3	1.5	17	B
26	916	8.572	7857.573	-31.2	2.3	21	B
27	917	8.618	7857.618	-29.6	1.7	18	B
28	920	14.567	7863.567	-19.4	2.4	16	B
29	1334	1908 Apr 25.834	8057.834	-31.1	2.9	16	B

30	1349	May	9.822	8071.822	-28.6	+1.9	23	B
31	1360		10.816	8072.816	-25.9	1.3	25	B,F mean of 2
32	1383		22.788	8084.788	-28.6	1.0	23	B mean of 2
33	1384		22.826	8084.826	-37.0	2.0	20	B
34	1390		23.847	8085.847	-30.1	1.8	19	B
35	1398		24.833	8086.833	-28.8	1.4	27	B mean of 2
36	1439	Jun	4.769	8097.769	-33.0	1.5	17	B
37	1448		5.770	8098.770	-28.2	2.3	10	B
38	1455		6.779	8099.779	-28.6	2.0	18	B
39	1473	1908 Jun	8.792	8101.792	-36.4	2.4	21	B
40	1511		18.786	8111.786	-40.3	3.1	14	B
41	1516		20.719	8113.719	-28.7	1.4	14	B
42	1523		21.793	8114.793	-29.2	4.8	6	B
43	1549		26.783	8119.783	-26.6	1.5	18	B
44	1566		28.738	8121.738	-34.2	1.9	20	B
45	1571		30.779	8123.779	-31.0	2.3	16	B
46	1602	Jul	6.781	8129.781	-26.5	1.7	13	B
47	1610		8.747	8131.747	-22.4	1.3	20	B
48	2085	Oct	18.544	8233.544	-27.1	2.6	15	B
49	2094		22.490	8237.490				plate missing
50	2102		28.531	8243.531	-38.3	4.0	10	F
51	2103		28.553	8243.553	-29.6	5.4	8	F
52	2108	Nov	1.524	8247.524	-36.8	3.6	8	F

53	2109	1.543	8247.543	-26.6	±6.2	5	F
54	2647	1909 Jul	5.685	8493.685	-34.8	3.2	7
55	2655		7.626	8495.626	-37.2	5.2	3
56	2658		7.733	8495.733	-46.9	4.6	6
57	2661		7.824	8495.824	-32.6	7.8	4

Astrometric Binary, period 1250 days (Alden, A.J. 51, 59, 1944).

HD 187362	ζ Sagittae		α = 19 <sup>h</sup> 44 <sup>m</sup> 32 <sup>s</sup> .		δ = +18° 53'	A3V
1 3740	1910 Aug	19.615	2418903.615	-16.5	±4.0 3.5	D
2 3745		20.604	8904.604	-23.5	9.7 3	D
3 3759		27.585	8911.585	-23.3	1	D 1 line only
4 3766		28.621	8912.621	-11.7	1	D 1 line only
5 3773		29.597	8913.597	-58.0	9.5 1.5	D
6 4644	1911 Jul	28.722	9246.722	-49.0	4.9 3	D seed 23
7 4706	Aug	19.688	9268.688	-30.1	5.0 4	D

In contrast to these velocities the Yerkes velocities are primarily positive. This star is a probable spectroscopic binary.

HD 187842	α Aquilae		α = 19 <sup>h</sup> : <sup>m</sup> 54 <sup>s</sup>	δ = +8° 35'	A7V
1 1551	1908 Jun 26.811	2418119.811	-9.0	±6.9 7	B
2 1829	Aug 24.673	8178.673	-13.7	3.4 5	B

3	2641	1909 Jun	4.675	8492.675	-21.0	$\pm 1.0$	7	B
4	2642		4.704	8492.704	-27.3	7.6	6	B
5	2726		27.672	8515.672	-26.0	2.7	9	B
6	2727		27.682	8515.682	-24.4	5.2	8	B
7	2738		30./59	8518.759	-13.9	8.7	7	B
8	2807	Aug	18.699	8537.699	-19.2	3.1	6	B
9	2808		18.711	8537.711	-24.5	3.8	7	B
10	2853		25.668	8544.668	-22.2	4.8	7	B
11	2854		25.676	8544.676	<u>-34.9</u>	6.7	7	B
				Mean	-21.8			

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HD 188260

13 Vulpeculae

 $\alpha = 19^h 49^m 13^s$  $\delta = +23^\circ 49'$ 

AO III

1	3144	1909 Oct	26.524	2418606.524	-36.8	$\pm 1.4$	7.5	D
2	3712	1910 Aug	8.655	8892.655	<u>-21.5</u>	1.8	6.5	D
				Mean	-29.7			

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100

HD 189178

 $\alpha = 19^h 53^m 46^s$  $\delta = +40^\circ 6'$ 

B5Vp?

1	5330	1912 Jun	20.764	2419574.764	-52.4	$\pm 10.0$	7.5	J
2	5344	Jul	6.747	9590.747	+40.9	1.4	3	J weak
3	5364		22.796	9606.796	-10.6	8.9	2 + 99.2 $\pm 8.9$	2 J secondary probably blend with primary
4	5388	Aug	6.749	9621.749	+5.6	6.8	5	J
5	5397		13.708	9628.708	-49.8	3.1	4	J
6	5402		16.733	9631.733	-18.2	6.8	5.5	J poor

30	6539	Oct 20.537	0426.537	-53.8	±4.2	7	-36.0	2'	J
31	6751	1915 Jul 2.694	0681.694	-18.5	1.0	4			J weak
32	6763	13.802	0692.802	-31.1	4.8	9			j
33	6795	Sep 1.592	0742.692	+14.0	6.8	7.5			J

Mean I.S. = -4.0

K line is probably a  
blend with stellar

HS 192685										
					$\alpha = 20^h 11^m 2^s$		$\delta = +25^\circ 17'$		B3V	
1	3707	1910 Aug 6.678	2418890.678	- 0.3	±9.1	2			D	underexposed
2	4581	1911 Aug 11.699	9260.699	- 7.9	3.8	5			D	
3	4873	Oct 19.544	9329.544	-12.0	4.8	9	-14.0	1	D	
4	5357	1912 Jul 14.809	9598.809	-15.0	5.2	5			D	
5	5452	Sep 19.636	9665.636	-25.0	5.6	5			D	
6	6375	1914 Jun 16.804	2420300.804	+ 2.8	2.7	6			D	
7	6398	Jul 11.746	0325.746	-34.6	5.7	7	-12.8	2	D	
8	6405	19.749	0333.749	- 2.7	2.4	6			D	
9	6413	21.729	0335.729	+ 1.1	2.1	8	-17.1	1	D	
10	6448	Aug 15.679	0360.679	-41.3	5.3	8			D	
11	6456	19.720	0364.720	- 5.1	5.0	8			D	

12	6465	26.740	0371.740	+ 2.6	±1.9	7	D
13	6479	Sep 13.681	0389.681	-23.9	2.3	6	D
14	6482	14.652	0390.652	-22.3	6.2	8	D
15	6505	25.595	0401.595	-17.5	3.6	7	D
16	6516	29.594	0405.594	-19.6	5.2	6	D
17	6519	Oct 1.622	0407.622	-18.2	4.2	8	D
18	6524	2.591	0408.591	-19.1	2.9	7	D
19	6528	5.613	0411.613	+ 5.4	3.0	6	D

Mean I.S. - -12.2

A spectroscopic binary. Efforts to find a period have so far been unsuccessful.

102	HD 192696	33 Cygn i	$\alpha = 20^h 11^m 4^s$	$\delta = +56^\circ 16'$	A3 IV-V
1	3922	1910 Oct 13.602	2418958.602	-56.3	1
2	3930	14.543	8959.543	-33.1	±8.1 2
3	3937	15.587	8960.587	-15.4	11.4 2.5
4	3949	18.539	8963.539	-45.5	4.6 2.5
5	3981	25.567	8970.567	-32.3	3.9 3.5
6	3992	30.554	8975.554	-19.5	4.4 4
7	4038	Nov 20.517	8996.517	-14.7	1.6 3
8	4045	22.472	8998.472	-32.4	5.6 3
9	4051	26.501	9002.501	-19.1	1.9 2.5

spectrum weak  
one line only

This star is classified as a possible spectroscopic binary with a long period on the basis of a 1961 Allegheny

series in which all velocities are close to 0 km/sec.

1103	HD 196724	1910 Jul	19.822	2418872.822	29 Vulpeculae	$\alpha = 20^h 34^m$	$\delta = +20^\circ 51'$	A0V
1	3651	23.701	25.715	26.697	28.714	31.682	36.688	D
2	3656	23.701	25.715	26.697	28.714	31.682	36.688	D
3	3660	23.701	25.715	26.697	28.714	31.682	36.688	D
4	3667	23.701	25.715	26.697	28.714	31.682	36.688	D
5	3674	23.701	25.715	26.697	28.714	31.682	36.688	D
6	3688	23.701	25.715	26.697	28.714	31.682	36.688	D
7	3694	23.701	25.715	26.697	28.714	31.682	36.688	D
8	3699	23.701	25.715	26.697	28.714	31.682	36.688	D
9	3706	23.701	25.715	26.697	28.714	31.682	36.688	D
10	3717	23.701	25.715	26.697	28.714	31.682	36.688	D
11	3723	23.701	25.715	26.697	28.714	31.682	36.688	D
12	3731	23.701	25.715	26.697	28.714	31.682	36.688	D
13	3741	23.701	25.715	26.697	28.714	31.682	36.688	D
14	3746	23.701	25.715	26.697	28.714	31.682	36.688	D
15	3752	23.701	25.715	26.697	28.714	31.682	36.688	D
16	3760	23.701	25.715	26.697	28.714	31.682	36.688	D
17	3767	23.701	25.715	26.697	28.714	31.682	36.688	D
18	3774	23.701	25.715	26.697	28.714	31.682	36.688	D
19	3778	23.701	25.715	26.697	28.714	31.682	36.688	D
20	3780	23.701	25.715	26.697	28.714	31.682	36.688	D

21	3787	7.588	9922.588	-23.3	±4.3	7	D
22	3796	11.631	9926.631	-35.7	1.8	4	D
23	3801	14.654	9929.654	-30.7	3.2	7	D
24	3807	15.630	9930.630	-18.8	4.6	7	D
25	3820	21.650	9936.650	-18.6	2.0	4	D
26	3828	22.629	9937.629	-30.1		3	D underexposed one side
27	3834	26.619	9941.619	-31.7	6.2	5	D
28	3841	28.626	9943.626	-20.3	3.8	4.5	D
29	3862	Oct 1.578	9946.578	-37.5	4.0	4	D
30	3875	7.563	9952.563	-28.4	2.6	8	D
31	3882	8.585	9953.585	-29.3	3.2	5	D
32	3891	10.598	9955.598	-28.5	0.7	8	D
33	3913	12.572	9957.572	-39.3	2.7	6	D
34	3931	14.583	9959.583	-36.5	8.8	5	D

This star is a spectroscopic binary. These velocities show a strong progression to more negative values.  
The mean velocity for October is more negative than any previously published velocity.

104	HD 196740	28 Vulpeculae	$\alpha = 20^h 34^m 10^s$	$\delta = +23^\circ 45'$	B5V
1	3661 1910 Jul 25.746	2418878.746	-29.1	$\pm 7.8$	4
2	4661 1911 Aug 8.747	9257.747	-41.5	7.1	2
3	4690	15.681	9264.681	-58.6	12.3
4	4854	Oct 13.579	9323.579	-31.9	4.5

105	HD 197345	$\alpha$ Cygni	$\alpha = 20^h 38^m 1^s$	$\delta = +44^\circ 55'$	A21a	
1	2643	1909 Jul	4.724	2418492.724 - 7.7	$\pm 1.6$ 10	B
2	2644		4.745	8492.745 - 5.6	0.8 10	B
3	2707		19.869	8507.869 - 3.9	1.2 10	B
4	2708		19.878	8507.878 - <u>5.1</u>	1.1 10	B
				Mean - 5.6		

106	HD 201601	$\delta$ Equulei	$\alpha = 21^h 5^m 29^s$	$\delta = +9^\circ 44'$	Fp	
1	4894 1911 Oct	26.542	2419336.542	-27.4	$\pm 1.7$ 22	D
2	4976 Dec	6.460	9337.460	-17.0	2.0 25	D
3	5392 1912 Aug	11.751	9625.751	-18.1	2.1 15	D
4	5418 Sep	5.724	9650.724	-19.2	3.9 16	n

A recent series at Allegheny in the 1960's suggests a variation in the range of -6 to -26 km/sec. Consequently we still must consider this star as a possible spectroscopic binary.

107	HD 202447	$\alpha$ Equulei	$\alpha = 21^h 10^m 50^s$	$\delta = +4^\circ 50'$	F8+A3
1	4601	1911 Jul 12.758	2419230.758 - 8.6	$\pm 2.1$ 41	D
2	4628	24.786	9242.786 -17.7	2.1 28	D
3	4635	26.821	9244.821 -13.5	1.6 25	D
4	4638	27.828	9245.828 -10.8	1.7 36	D
5	4645	28.778	9246.778 -16.5	1.1 29	D
6	4652	30.783	9248.783 -13.3	1.8 30	D

7	4659	Aug	6.828	9255.828	-14.1	4.9	18	D
8	4668		9.767	9258.767	-13.2	1.6	33	D
9	4676		10.763	9259.763	-10.3	3.5	29	D
10	4682		11.727	9260.727	-16.8	2.3	30	D
11	4691		15.709	9264.709	-20.6	2.0	26	D
12	4701		18.733	9267.733	-16.6	1.9	24	D
13	4707		19.742	9268.742	-18.1	2.1	21	D
14	4717		20.753	9269.753	-14.4	1.0	42	D
15	4724		21.720	9270.720	-22.1	1.6	19	D
16	4730		22.706	9271.706	-13.5	1.0	31	D
17	4744	Sep	1.683	9281.683	-13.7	1.3	28	D
18	4754		3.692	9283.692	-21.5	1.1	26	D
19	4761		4.647	9284.647	-20.2	1.3	31	D
20	4767		6.600	9286.600	-15.9	1.7	19	D
21	4772		11.588	9291.588	-21.1	1.6	26	D
22	4779		12.641	9292.641	-25.7	2.1	31	D
23	4786		13.631	9293.631	-24.9	2.6	23	D
24	4792		17.669	9297.669	-20.4	1.7	28	D
25	4799		18.670	9298.670	-28.7	3.1	13	D
26	4803		19.635	9299.635	-18.2	1.0	25	D
27	4809		20.665	9300.665	-17.0	1.5	30	D
28	4815		22.665	9302.665	-19.3	1.4	27	D
29	4825		26.655	9306.655	-22.0	1.7	21	D

30	4833	30.598	9310.598	- 8.9	*3.8	5	D	underexposed
31	4843	Oct 8.601	9318.601	-20.6	1.6	26	D	
32	4853	13.549	9323.549	-18.3	1.5	27	D	
33	4866	18.577	9328.577	-17.0	1.2	31	D	
34	4880	21.554	9331.554	-20.8	1.4	9	D	underexposed
35	4887	25.574	9335.574	-19.5	2.8	21	D	
36	4901	28.517	9338.517	-17.2	1.3	28	D	
37	4916	Nov 2.526	9343.526	-21.6	1.1	27	D	
38	4922	5.516	9346.516	-19.9	1.6	30	D	
39	4928	10.502	9351.502	-21.3	1.4	33	D	
40	4935	13.506	9354.506	-22.8	1.1	24	D	
41	4940	16.506	9357.506	-17.8	1.3	28	D	
42	4945	19.516	9360.516	-20.5	2.0	26	D	
43	4949	21.483	9362.483	-17.8	1.4	27	D	
44	4958	26.494	9367.494	-15.8	1.7	26	D	
45	4969	Dec 5.456	9376.456	-16.7	1.6	25	D	
46	4984	7.452	9378.452	-16.0	1.3	29	D	
47	4997	28.464	9399.464	-15.5	1.1	27	D	
48	5005	31.466	9402.466	-19.8	1.7	26	D	

These observations do not satisfy the 97.56 day period of Deutsch (P.A.S.P. 66, 58, 1954) and suggest the period may be longer. Deutsch, however, points out the distinct advantage of condensed spectra for determining radial velocities of this star. Twice the period is a possibility. Observations of this star at Allegheny are continuing.

HD 203064		68 Cygni		$\alpha = 21^h 14^m 43^s$	$\delta = +43^\circ 31'$	08
1	2869	1909 Aug 29.761	2418548.761	-20.6	- 9.6	6 J
2	3120	Oct 13.562	593.562	-29.2	-19.7	6 J
3	3178	Nov 4.556	615.556	-27.7	-18.2	4 J
4	3233	15.501	626.501	- 9.0	-16.5	3 J
5	4602	1911 Jul 12.796	9230.796	+ 3.7	-21.9	5 J
			Mean	-14.8	Mean I.S. =	-17.0

This star does not appear to be variable in velocity.

109	HD 207650	14 Pegasus	$\alpha = 21^h 45^m 25^s$	$\delta = +29^{\circ} 43'$	A0V	
1	2868	1909 Aug 29.728	2418548.728	-32.8	2.9 6	J
2	3700	1910 Aug 5.715	8889.715	-20.5	2.8 12	J
3	4662	1911 Aug 8.781	9257.781	-30.2	3.3 9	J
4	4883	Oct 23.580	9333.580	-20.6	2.7 7	J

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Orbit by Petrie (Publ. D.A.O. Z, 245, 1940). These velocities fall on the flat portion of the curve and are blended velocities of little significance.

110	HD 208057	16 Pegasi	$\alpha = 21^h 48^m 31^s$	$\delta = +25^\circ 27'$	B3V	
1	3725	1910 Aug 12.742	2418896.742	-18.8	4.3 7	D
2	4692	1911 Aug 15.740	9264.740	-28.4	5.4 4	D
3	4820	Sep 24.672	9304.672	-19.5	1.7 14	D

A21a

 $\delta = +60^{\circ} 40'$  $\alpha = 21^h 42^m 34^s$ 

v Cephei

HD 207260

1	4954	1911 Nov	22.520	2419363.520	- 9.8	$\pm 2.3$	19	D
2	5430	1912 Sep	8.695	9654.695	- 9.9	0.7	22	D
3	5910	1913 Jul	20.811	9969.811	-23.3	1.6	19	D
4	5958	Aug	25.726	2420005.726	<u>-18.8</u>	1.6	20	D

Mean -15.3

HD 209819

Aquari

 $c = 22^h m 2s$ 

B8V

 $\delta = -14^\circ 21'$ 

Mean I.S. = 6.8

Mean -21.9

	4	4857	Oct 15.593	9325.593	-28.6	$\pm 1.6$	14	-5.5	1	D
1	6409	1914 Jul 20.730	2420334.730	-24.0	$\pm 3.4$	3				D
2	6421	25.812	0339.812	-14.0	1.8	5				D
3	6431	29.819	0343.819	-29.0	1.3	2				D
4	6444	Aug 13.771	0358.771	-45.5	12.4	3				D
5	6449	15.724	0360.724	-13.7	5.8	4				D
6	6457	19.787	0364.787	-3.1	4.5	3.5				D
7	6460	21.758	0366.758	+1.8	5.9	4				D
8	6468	29.747	0374.747	-15.0	4.6	3.5				D
9	6471	31.735	0376.735	-4.9	15.8	3				D underexposed
10	6476	Sep 8.694	0384.694	-10.9	9.2	3				D
11	6506	25.651	0401.651	-24.5	1.0	3				D
12	6507	27.692	0403.692	-15.3	1.8	3				D
13	6511	28.653	0404.653	-16.6	4.8	3				D
14	6520	Oct 1.676	0407.676	-31.4	4.5	4				D
15	6525	2.659	0408.659	-23.2	2.1	3.5				D
16	6531	11.620	0417.620	-17.2	4.7	2.5				D
17	6535	19.603	0425.603	-33.6	6.3	3				D
18	6540	20.606	0426.606	-34.5	3.8	3.5				D
19	6544	22.586	0428.586	-53.8	14.9	3				D

20	6548	25.590	0431.590	-17.1	+6.0	2.5	D
21	6573	Nov 17.536	0454.536	+0.7	4.0	5	D
22	6582	27.503	0464.503	-45.5	2.8	4	D
23	6770	1915 Jul 21.808	0700.808	+10.0	2.2	4	D
24	6784	Aug 13.774	0723.774	-13.5	7.9	3	D
25	6854	Oct 29.588	0800.588	-14.9	5.4	4	D

The spectrum of this star has been described as having double lines (Lee, Ap. J. 39, 42, 1914). Inspection of these plates does indeed show a suggestion of duplicity although not convincingly. These velocities are presented "as is" pending a solution to the question. If the lines are regarded as single then a steady progression to more negative values occurs from the middle of August to the middle of October. We regard this star to be a probable spectroscopic binary.

112	HD 210418	$\theta$ Pegasi	$\alpha = 22^{\text{h}}5^{\text{m}}9^{\text{s}}$	$\delta = +5^{\circ}42'$	A2V	
1	3668	1910 Jul 26.735	2418879.735	- 8.8	5.8 6	D
2	3675	28.743	8881.743	-18.7	5.3 6	D
3	3689	31.729	8884.729	-21.6	3.1 6	D
4	3695	Aug 4.810	8888.810	-18.8	7.0 4	D possibly double
5	3701	5.748	8889.748	-15.9	3.0 6	D
6	3708	6.721	8890.721	-50.5	14.0 2	D
7	3713	8.693	8892.693	-25.4	4.7 5	D
8	3718	11.725	8895.725	-26.0	4.6 6	D
9	3724	12.708	8896.708	-12.7	6.9 5	D
10	3732	13.732	8897.732	-18.3	16.9 3	D
11	3742	19.672	8903.672	- 8.3	4.5 7	D

12	3747	20.685	8904.685	- 8.2	±1.0	2	D
13	3753	26.675	8910.675	-36.6	6.0	4	D
14	3761	27.663	8911.663	-24.9	2.8	4	D
15	3768	28.706	8912.706	+ 1.2	0.8	4	D
16	3775	29.664	8913.664	-19.0	5.1	4	D
17	3781	Sep 6.667	8921.667	-18.5	5.6	2	D
18	3788	7.632	8922.632	-70.6	0.3	2	D
19	3797	11.681	8926.681	-12.0	4.5	3	D possibly double
20	3802	14.696	8929.696	-32.0	4.6	5	D
21	3808	15.670	8930.670	- 6.0	3.4	6	D
22	3814	16.604	8931.604	- 9.4	2.9	6	D
23	3816	17.651	8932.651	-20.1	3.0	5	D
24	3817	20.735	8935.735	+ 0.5	5.1	3	D
25	3821	21.692	8936.692	+ 3.2	4.8	3	D
26	3829	22.735	8937.735	-20.6	4.2	1	D
27	3835	26.668	8941.668	-24.8	2.2	3	D
28	3842	28.662	8943.662	-24.1	6.4	4	D narrow spectrum possibly double
29	3850	29.649	8944.649	-15.6	6.7	5	D
30	3859	30.675	8945.675	- 9.3	4.4	5	D
31	3863	Oct 1.622	8946.622	- 5.4	2.8	4	D possibly double
32	3869	2.653	8947.653	-14.1	4.3	4	D
33	3877	7.657	8952.657	+ 0.2	1.2	6	D
34	3883	8.615	8953.615	-19.2	1.5	7	D

35	3892	10.619	8955.619	-19.7	+3.8	8	D
36	3905	11.682	8956.682	-20.3	4.3	6	D
37	3914	12.608	8957.608	- 9.1	2.4	5	D
38	3923	13.638	8958.638	-17.6	4.6	6	D
39	3938	15.617	8960.617	-29.7	6.9	7	D
40	3944	17.562	8962.562	- 8.8	4.4	6	D
41	3950	18.585	8963.585	-16.2	4.0	5	D
42	3955	19.621	8964.621	-24.9	3.4	6	D
43	3964	20.575	8965.575	- 7.9	2.4	5	D
44	3974	23.621	8968.621	- 2.5	4.8	6	D
45	3982	25.611	8970.611	-26.5	3.2	5	D
46	3986	26.606	8971.606	-34.0	3.4	1	D
47	3987	29.549	8974.549	-37.0	2.8	7	D
48	4002	31.518	8976.518	-24.3	2.2	8	D
49	4010	Nov 4.622	8980.622	- 6.5	4.9	6	D
50	4020	8.544	8984.544	- 8.7	3.9	7	D
51	4039	20.551	8996.551	- 5.2	5.5	7	D
52	4046	22.503	8998.503	-38.1	2.1	4	D possibly double
53	4052	26.541	9002.541	-12.0	2.3	6	D
54	4066	1910 Dec 4.511	9010.511	-16.9	2.4	4	D possibly double
55	4067	8.478	9014.478	-27.9	5.5	5	D
56	4073	9.488	9015.488	- 5.6	4.3	6	D
57	4078	13.543	9019.543	-10.4	2.3	4	D

58	4085	14.469	9020.469	- 8.3	±2.7	5	D
59	4103	17.451	9023.451	-12.3	4.4	7	D
60	4113	21.515	9027.515	-26.3	5.3	6	D
61	4120	25.453	9031.453	-14.9	8.1	6	D
62	4123	27.458	9033.458	-13.3	5.1	7	D
63	4614	1911 Jul 15.809	9233.809	-17.5	6.3	7	D
64	4629	24.824	9242.824	-10.8	4.1	7	D
65	4639	27.858	9245.858	-17.9	6.6	7	D
66	4653	30.815	9248.815	-11.9	5.0	7	D
67	4669	Aug 9.799	9258.799	- 9.5	3.5	6	D
68	4677	10.801	9259.801	-10.5	1.0	7	D
69	4683	11.767	9260.767	-15.3	2.5	7	D
70	4702	18.762	9267.762	- 6.7	1.3	7	D
71	4708	19.769	9268.769	- 9.6	3.3	6	D
72	4718	20.812	9269.812	-12.8	3.1	6	D
73	4725	21.749	9270.749	- 3.9	2.6	7	D
74	4731	22.756	9271.756	- 7.5	3.2	6	D
75	4738	31.728	9280.728	- 9.3	2.2	6	D
76	4745	Sep 1.715	9281.715	-13.0	0.7	6	D
77	4755	3.721	9283.721	-16.0	1.7	6	D
78	4762	4.678	9284.678	-21.3	5.5	7	D
79	4773	11.622	9291.622	- 9.6	3.8	7	D
80	4780	12.684	9292.684	+ 8.0	2.6	7	D

possibly double  
wide spectrum  
mean of 2

	HD 211924	30 Pegasi	$\alpha = 22^h 15^m 26^s$	$\delta = + 50^\circ 17'$	
81	4787	13.662	9293.662	- 8.9	2.1 7
82	4793	17.708	9297.708	-20.9	3.5 4
83	4800	18.717	9298.717	-17.0	10.3 6
84	4804	19.669	9299.669	-31.4	4.9 6
85	4810	20.694	9300.694	-14.8	1.1 5
86	4816	22.694	9302.694	- 8.4	2.4 6
87	4826	26.692	9306.692	-14.6	1.9 4
1	4910	1911 Oct 29.566	2419339.566	+13.0	2.3 20
2	5463	1912 Sep 27.649	9673.649	- 2.5	2.0 20
3	6569	1914 Nov 10.572	2420447.572	-10.8	5.0 9
4	6577	23.519	0460.519	-12.5	2.2 12.5
			Mean - 0.7		

85 III

The published range is small for a star this early in spectral type. We do not consider this star to be a spectroscopic binary.

114	HD 212076	31 Pegasi	$\alpha = 22^h 16^m 36^s$	$\delta = +11^\circ 42'$	B2Ve
1	4844	1911 Oct 8.641	2419318.641	0.0 $\pm$ 3.0	10
2	4855	13.631	9323.631	+16.4	3.6
3	4874	19.623	9329.623	-7.8	1.1
				<u>13.5</u>	
				Mean I. S. -11.0	Mean em. +23.5
					em. +16.0 $\pm$ 4.7
					em. +31.0 $\pm$ 1.7

Mean + 3.3

115	HD 212097	32 Pegasi	$\alpha = 22^h 16^m 42^s$	$\delta = +27^\circ 50'$	B8V
1	3658 1910 Jul 23.793	2418876.793 - 1.3	$\pm 2.7$ 9		D
2	3662	8878.781 - 3.7	3.8 8.5		D
3	3714 Aug 8.749	8892.749 +13.5	1.4 7		D
4	4583 1911 Jul 5.850	9223.850 + 6.7	4.5 9		D
5	4603	12.836	9230.836 +13.0		D
6	4646	28.823	9246.823 + <u>5.3</u>		D seed 23

Mean + 5.2

116	HD 212120	2 Lacertae	$\alpha = 22^h 16^m 54^s$	$\delta = +46^\circ 2'$	B6IV
1	6779 1915 Aug 8.823	2420718.823 -12.7	$\pm 6.1$ 10	-28.5 2	D
2	6785	13.830	0723.830 -48.9		D
3	6792	31.671	0741.671 -84.3		D
4	6799 Sep 7.625	0748.625 +12.4	2.0 10		D
5	6807	10.708	0751.708 -28.4		D
6	6812	15.699	0756.699 -15.0	- 6.9 3	D
7	6827 Oct 8.633	0779.633 +70.8	3.2 14		D
8	6867 Nov 11.544	0813.544 +61.4	1.7 14		D
Mean I. S. -15.5					

The velocities fit satisfactorily onto the orbit of Baker (Publ. A.O., 1, 93, 1910) with  $P = 2^d 616394$  and  $T_0 = 2413193.30$ . Some blending is evident.

117	HD 213420	6 Lacertae	$\alpha = 22^h 26^m 10^s$	$\delta = +42^\circ 37'$	B2IV
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1	821	1907 Sep	6.755	2417825.755	-18.2	+1.8	19	- 0.4	2	J	mean of 2
2	822		6.788	7825.788	-25.6	1.8	18	+ 3.2	3	J	mean of 2
3	829		11.684	7830.684	-18.5	2.0	25	-13.8	4	J	mean of 2
4	830		11.715	7830.715	-21.1	2.0	13	-16.3	3	J	
5	831		11.737	7830.737	-20.7	1.2	18	-11.9	4	J	mean of 2
6	877		20.649	7839.649	-20.2	1.7	17	-21.3	1	J	spectrum weak mean of 2
7	885		26.708	7845.708	-22.4	1.5	16	-13.0	3	J	mean of 2
8	893	Oct	2.662	7851.662	-18.0	2.3	16	-25.0	3	J	mean of 2
9	894		2.689	7851.689	-12.6	2.2	18	- 4.6	3	J	mean of 2
10	909		6.662	7855.662	-22.0	1.3	18	-17.2	5	J	mean of 2
11	910		6.700	7855.700	-23.8	1.7	16	-17.0	1	J	mean of 2
12	918		8.653	7857.653	-23.1	1.1	17	-14.6	4	J	mean of 2
13	919		8.687	7857.687	-34.9	2.7	11	-22.5	2	J	mean of 2
14	958	Nov	10.521	7890.521	-24.7	1.9	24	-12.5	4	J	IS mean of 2, 2nd. meas. by J-8.3 reject
15	959		10.562	7890.562	-21.4	2.0	26	-15.4	3	J	mean of 2
16	972		13.549	7893.549	-20.7	1.7	27	-15.0	5	J,B	2 meas. by J mean of 2
17	973		13.581	7893.581	-22.0	2.1	11	-11.6	4	J	mean of 2
18	983		15.535	7895.535	-16.1	1.1	19	-19.3	6	J,B	2 meas. by J mean of 2
19	984		15.559	7895.559	-19.8	0.9	23	-17.3	6	J,B	2 meas. by J mean of 2
20	999		16.515	7896.515	-14.4	2.2	22	- 9.8	4	J	mean of 2
21	1391	1908 May	23.873	8085.873	+ 9.6	4.1	18	- 1.7	4	J	mean of 2
22	1399		24.869	8086.869	- 8.6	3.6	12.5	+ 2.4	2	J	
23	1407		25.865	8087.865	- 4.3	2.0	5.5			J	

47	4768	Sep	7.575	- 1.4 ± 3.3	7	- 6.9	2	J
48	4902	Oct	28.549	- 9.7	1.8	17	- 8.0	2
49	5345	1912 Jul	6.790	-18.0	3.2	12.5	- 3.0	2
50	5425	Sep	7.735	-27.3	4.2	11.5	-26.8	2
51	5513	Oct	16.592	-22.7	2.6	11	-25.3	2

Mean I.S. -14.4

These observations show evidence of a long period variation. Yearly means formed from these and from all published observations are listed below.

Observatory	Year	Mean J.D. 2410000+	Mean RV	#Obs's	Observatory	Year	Mean J.D. 2410000+	Mean RV	#Obs's
Yerkes	1903	6335.1	-13.4	3	Yerkes	1905	7118.6	-11.5	1
A.O. Yerkes	1907	7859.9	-21.1	21	A.O.	1908	8117.3	- 9.2	16
A.O.	1910	8927.0	-12.7	7	A.O. Yerkes	1911	9291.8	- 7.7	6
A.O.	1912	9644.0	-23.6	3	Lick	1924	14105.8	-14	1
Lick, D.A.O.	1925	14371.9	- 5.6	3	D.A.O.	1926	14763.3	-10.3	4
H-P	1942	20615.0	- 4.6	12					

These means appear to fit a period of 880 days with the following preliminary elements -  $P = 880^d$ ,  $T_0 = 2416300.0$ ,  $\phi$  periastron  $700^\circ$ ,  $e = 0.30$ ,  $\omega = 190^\circ$ ,  $\gamma = -11.9$  km/sec.,  $k = 9$  km/sec.

118	HD 214734	30 Cephe	$\alpha = 22^{\text{h}}35^{\text{m}}6^{\text{s}}$	$\delta = + 63^{\circ} 4'$	A2			
1	5929	1913 Aug	2.761	2419982.761	- 3.5 ± 5.0	3	J	
2	6004	Sep	13.626	2420024.626	-13.8	2.7	5.5	J
3	6036	Oct	8.586	0049.586	+11.0	9.0	4.5	J
4	6417	1914 Jul	22.829	0336.829	-20.8	12.6	3	J
5	6437	Aug	6.812	0351.812	- 5.8		2	J
6	6445		13.819	0358.819	- 3.9	0.6	5	1 line only spectrum weak
7	6461		21.809	0366.809	+43.2		2	J
8	6489	Sep	17.703	0393.703	-12.6	11.3	6	spectrum weak 1 line only
9	6494		20.684	0396.684	- 3.9	3.3	11	J
10	6498		21.675	0397.675	+ 1.5	3.0	4.5	J
11	6526	Oct	2.719	0408.719	+20.9		2	J
								1 line only spectrum weak

1 line only  
spectrum weak

spectrum weak  
1 line only

1 line only  
spectrum weak

24	1424	Jun	1.826	8094.826	+ 3.5	±3.1	11		J	
25	1441		4.865	8097.865	-14.5	1.7		-23.2	4	J mean of 2
26	1449		5.809	8098.809	- 5.7	2.4	16	- 9.0	3	J
27	1456		6.832	8099.832	-34.7	6.8	4			J
28	1466		7.825	8100.825	- 5.2	3.2	16	-14.1	4	J
29	1474		8.830	8101.830	-16.8	4.0	18			J I.S. rejected
30	1485		11.826	8104.826	-10.2	2.4	12			J I.S. rejected
31	1498		15.831	8108.831	- 2.3	2.4	13			J I.S. rejected
32	1506		17.802	8110.802	-16.8	5.4	19	-21.4	1	J
33	1553		26.863	8119.863	-21.3	3.4	17	-39.8	3	J
34	1580	Jul	1.816	8124.816	-11.3	4.0	14			J
35	1612		8.809	8131.809	-14.3	0.8	14	- 9.4	3	J
36	1666		19.739	8142.739	- 5.8	2.9	14	-14.7	4	J
37	2241	Dec	2.561	8278.561	-22.6	1.3	18	-14.3	3	J
38	3644	1910 Jul	13.504	8866.804	-17.7	3.3	16	-21.7	3	J
39	3676		28.771	8881.771	-27.9	4.7	14	-15.0	3	J
40	3782	Sep	6.717	8921.717	-12.8	6.4	12	- 9.8	1	J comparison weak on pier side
41	3836		27.748	8942.748	-13.0	4.5	8			J comparison and spectrum weak
42	3851		29.688	8944.688	- 4.0	6.7	8.5			J comparison and spectrum weak
43	3893	Oct	10.642	8955.642	0.0	2.1	5	-19.3	3	J
44	3993		30.584	8975.584	-10.0	4.2	10			J plate fogged
45	4551	1911 Jun	30.802	9218.802	-14.4	5.4	8	-29.6	1	J
46	4693	Aug	15.768	9264.768	- 7.3	5.4	6.5	- 7.1	2	J

i2 6541 20.661 0426.661 +13.3 +6.8 8 J

An examination of these as well as 10 recent Allegheny plates of 30 Cep fails to confirm doubling of  $\lambda 4481$  reported by Harper (Publ. D.A.O. Z, 92, 1937). The velocity range observed here, +43 to -20, matches the published range of velocities. The lines are very broad and the star should be remeasured on an oscilloscope contour comparator. This star is probably a spectroscopic binary.

119	HD 214993	12 Lacertae	$\alpha = 22^h 37^m 0^s$	$\delta = +39^\circ 42'$	B2 III
1	4911 1911 Oct 29.607	2419339.607	-26.6	+1.8 13	-10.1 3 D
2	4985 Dec 7.489	9378.411	+1.3	1.8 13	-2.6 1 D
3	5331 1912 Jun 20.815	9574.815	-24.9	4.3 -9.5	-13.0 1 D I.S. is weak
4	5368 Jul 26.818	9610.818	-12.4	2.9 10.5	+4.2 0.5 D I.S. is crooked
5	5385 Aug 4.845	9619.845	+12.8	2.7 12	+25.2 1 D I.S. is weak
6	5393 11.823	9626.823	+9.0	2.6 10	+34.4 1 D
7	5399 14.747	9629.747	-6.2	2.7 14.5	-15.3 0.5 D I.S. is faint
8	5422 Sep 6.721	9652.721	-33.6	2.6 10.5	+22.4 0.5 D I.S. is faint
9	5426 7.776	9653.776	-18.9	2.0 13	+2.9 0.5 D
10	5435 9.749	9655.749	-16.0	3.8 9	+5.2 1 D I.S. is weak
11	5443 12.685	9658.685	-11.8	2.8 12	-3.7 1 D
12	5453 19.710	9665.710	-32.1	3.6 13	D
13	5469 29.595	9675.595	-24.6	1.3 15.5	-15.8 3 D
14	5483 Oct 2.595	9678.595	-41.3	3.3 9	D
15	5498 6.615	9682.615	-7.7	3.0 14	-20.4 1 D
16	5517 17.540	9693.540	-24.1	2.3 16	-27.2 2 D
17	5532 28.534	9704.534	-20.6	3.0 8	D

18	5535	29.503	9705.503	-27.2	+2.2	12	D
19	5551	Nov 8.605	9715.605	-11.7	3.0	13	D
20	5559	16.542	9723.542	+ 7.7	3.2	11.5	D
21	5585	29.494	9736.494	- 4.3	4.5	11	D
22	5592	Dec 3.520	9740.520	- 9.7	2.8	15	D
23	5593	7.470	9744.470	-25.2	2.2	10	D
24	5599	12.481	9749.481	-43.0	3.3	14	D
25	5869	1913 Jun 27.817	9946.817	-29.3	2.9	14	D
26	5876	29.848	9948.848	+ 0.5	2.6	16	D
27	5879	Jul 2.791	9951.791	- 8.7	3.6	14	D
28	5898	15.795	9964.795	-45.2	3.5	14	D
29	5901	17.819	9966.819	- 6.1	3.5	12	D
30	5907	19.800	9968.800	-14.6	4.8	14	D
31	5917	26.774	9975.774	-19.5	2.8	11	D
32	5923	30.829	9979.829	- 3.5	3.6	11	D
33	5932	Aug 4.786	9984.786	- 6.0	3.1	12	D
34	5939	9.714	9989.714	-28.1	2.9	10.5	D
35	5948	22.786	2420002.786	- 7.6	3.1	13.5	D
36	5950	23.677	0003.677	- 5.1	1.9	13	D
37	5955	24.785	0004.785	-19.2	2.8	15	D
38	5965	29.707	0009.707	+11.1	2.7	13.5	D
39	5972	31.678	0011.678	+ 6.7	1.7	14	D
40	5984	Sep 5.664	0016.664	- 9.0	3.7	13	D

I.S. is weak

+18.3 0.5

- 9.7 1

- 5.8 2

- 7.3 1

-32.8 1

-18.4 2

- 8.1 1

41	6001	10.728	0021.728	-11.9	±3.6	8	D	underexposed
42	6013	24.638	0035.638	-34.7	3.0	14.5	D	-23.0 2
43	6025	Oct 4.647	0045.647	- 8.5	1.9	13	D	-19.7 1
44	6028	6.636	0047.636	-32.2	1.0	13	D	-20.4 1
45	6032	7.621	0048.621	-18.1	2.7	15	D	- 7.7 1
46	6045	13.617	0054.617	-30.2	1.7	15	D	-14.8 1
47	6056	22.608	0063.608	-10.7	2.7	12.5	D	-14.8 1
48	6061	Nov 2.574	0074.574	- 4.8	2.8	14	D	- 9.3 2
49	6069	5.599	0077.599	-13.4	2.6	15	D	+ 0.8 2
50	6075	6.604	0078.604	+ 2.0	2.5	14	D	+ 3.5 2
51	6086	17.562	0089.562	-38.7	2.3	13	D	-11.2 3
52	6090	20.538	0092.538	+ 0.2	2.8	14	D	-14.8 1
53	6097	21.540	0093.540	- 5.1	3.9	11	D	0.0 2
54	6123	Dec 12.504	0114.504	- 7.9	1.3	13.5	D	-13.6 4
55	6142	19.475	0121.475	- 3.2	1.2	14	D	-16.1 4
56	6399	1914 Jul 11.808	0325.808	-10.1	2.8	16	D	-47.2 2
57	6414	21.737	0335.797	+ 5.8	2.4	12.5	D	-14.7 1
58	6416	22.781	0336.781	+16.0	4.2	10	D	- 3.8 1
59	6420	25.767	0339.767	-22.2	3.6	15	D	- 6.4 2
60	6424	26.751	0340.751	-46.1	2.2	12.5	D	-20.6 1
61	6450	Aug 15.769	0360.769	-12.2	3.2	9	D	- 6.6 2
62	6466	26.812	0371.812	-10.7	2.6	5	D	underexposed
63	6483	Sep 14.726	0390.726	-21.7	2.1	12	D	- 9.4 1

64	6499	21.728	0397.728	-20.6	+3.0	12	-21.9	1	D
65	6512	28.707	0404.707	-23.7	3.2	11.5	-1.5	2	D
66	6532	Oct 11.687	0417.687	+10.3	3.6	13	+1.7	2	D
67	6536	19.664	0425.664	-30.8	2.3	10.5	-23.9	3	D
68	6545	22.652	0428.652	-11.4	1.1	16	-22.0	3	D
69	6554	Nov 2.610	0439.610	-27.7	3.1	14	-31.4	2	D
70	6562	6.592	0443.592	+6.7	2.8	14	-4.5	2	D
71	6566	9.592	0446.592	-34.8	1.9	14	-36.3	1	D
72	6571	13.570	0450.570	-25.1	2.6	15	-18.4	2	D
73	6583	27.569	0464.569	-19.9	2.8	16	-6.3	2	D
74	6746	1915 Jun 26.826	0675.826	-1.5	3.0	14	+5.6	1	D
75	6757	Jul 8.765	0687.765	-25.6	1.8	17	-13.9	2	D
76	6765	17.834	0696.834	-23.0	1.4	14	-7.2	1	D
77	6773	22.803	0701.803	-37.4	2.5	14	+2.0	2	D
78	6788	Aug 16.725	0726.725	-42.1	4.4	7			D underexposed
79	6796	- Sep 1.776	0742.776	-28.6	1.7	14	-5.7	1	D
80	6803	8.764	0749.764	-13.5	1.8	14	+11.7	2	D
81	6808	10.765	0751.765	-5.6	5.9	8			D
82	6813	15.782	0756.782	-7.5	8.2	5			D
83	6818	28.719	0769.719	-22.4	2.2	13	+2.4	2	D
84	6823	Oct 7.700	0778.700	-27.9	2.3	16	-5.9	1	D
85	6828	8.689	0779.689	-8.5	1.9	14	-10.2	2	D
86	6838	21.634	0792.634	-20.5	0.7	16	-26.5	2	D

87	6844	22.617	0793.617	-17.6	±2.5	19	- 7.9	3	D
88	6849	26.628	0797.628	-25.9	1.6	17	-10.3	2	D
89	6855	29.665	0800.665	-30.9	3.2	12.5	-16.4	2	D
90	6861	Nov 5.630	0807.630	-40.4	3.2	9			D
91	6863	9.583	0811.583	- 0.9	2.6	18	- 9.4	3	D
92	6868	11.600	0813.600	-26.3	4.0	11	+ 5.1	1	D
93	7078	1916 Aug 28.768	1104.768	-13.4	2.9	13	-18.8	2	D
94	7080	31.656	1107.656	-30.7	1.6	15	-10.6	1	D I.S. is faint
95	7081	31.740	1107.740	- 9.1	2.1	15	- 2.7	2	D
96	7083	Sep 2.684	1109.684	- 6.3	2.1	15	-18.1	1	D

Mean I.S. - -11.3

120	HD 214994		$\alpha = 22^h 37^m 4^s$	$\delta = +28^\circ 47'$	A1V
1	3726	1910 Aug 12.769	2418896.769 + 3.5	$\pm 1.8$ 9	D
2	3754	26.707	8910.707 + 2.9	4.0 7	D
3	4703	1911 Aug 18.801	9267.801 - 1.6	1.9 9	D
4	4774	Sep 11.663	9291.663 + 8.4	1.4 5.5	D
			Mean + 2.7		

121	HD 216735		$\alpha = 22^h 50^m 12^s$	$\delta = +8^\circ 17'$	A1V
1	3690	1910 Jul 31.761	2418884.761 - 26.6	$\pm 6.7$ 6	D
2	4726	1911 Aug 21.785	9270.785 - 28.2	5.8 5	D
3	4888	Oct 25.619	9335.619 - 20.1	3.9 6	D
4	4950	Nov 21.535	9362.535 - 19.9	3.0 7	D

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The range of the published velocities together with these velocities is +16 to -28 km/sec. This is a probable spectroscopic binary.

122	HD 216916		$\alpha = 22^h 51^m 50^s$	$\delta = +41^\circ 4'$	B2IV
1	5403	1912 Aug 16.802	2419631.802 - 37.8	$\pm 1.8$ 15	D
2	5419	Sep 5.801	9651.801 - 9.2	3.4 11	D
3	5431	8.767	9654.767 - 38.3	1.5 15	D
4	5440	11.777	9657.777 - 13.3	3.6 11	D
5	5447	16.661	9662.661 + 3.8	1.8 15	D
6	5456	20.628	9666.628 - 47.3	1.7 16	D
7	5464	27.707	9673.707 + 1.9	2.4 12	D

8	5470	29.651	9675.651	-19.0	1.8	11	-22.3	1	D
9	5475	30.718	9676.718	-34.0	1.8	15	-20.8	1	D
10	5477	Oct 1.590	9677.590	-41.7	3.3	15	-17.9	0.5	D
11	5484	2.655	9678.655	-43.3	2.1	17	-30.8	2	D
12	5489	4.653	9680.653	-32.6	2.2	11			D
13	5495	5.673	9681.673	-17.4	3.1	14			D
14	5499	6.690	9682.690	-15.0	1.9	12	- 8.0	0.5	D
15	5503	14.594	9690.594	-32.3	1.9	15	-29.0	4	D
16	5507	15.578	9691.578	-18.8	2.1	18	-21.1	2	D
17	5515	16.674	9692.674	-38.0	2.0	16	-23.6	2	D
18	5518	17.610	9693.610	-11.5	2.0	15	-18.6	3	D
19	5521	20.537	9696.537	- 0.5	1.7	13	- 4.5	2	D
20	5526	26.587	9702.587	-31.1	1.8	15	-19.9	2	D
21	5530	27.572	9703.572	-26.9	2.4	18	-12.2	1	D
22	5533	28.643	9704.643	-24.8	2.0	12			D
23	5536	29.573	9705.573	-31.4	5.0	7			D underexposed
24	5539	30.679	9706.679	- 2.4	2.1	13			D
25	5542	31.644	9707.644	+ 3.3	7.1	4			D underexposed
26	5543	Nov 3.543	9710.543	- 3.4	2.5	15	-22.9	4	D
27	5549	4.620	9711.620	-26.4	2.5	4			D underexposed
28	5555	11.530	9718.530	-18.6	3.2	19	-28.7	2	D comparison weak
29	5560	16.595	9723.595	-16.3	4.5	6			D underexposed
30	5561	18.517	9725.517	-42.7	1.4	16	-29.5	3	D

31	5566	19.507	9726.507	-46.8	±1.4	13		D
32	5570	20.500	9727.500	-36.5	1.5	14	-13.0	1
33	5574	22.496	9729.496	-15.4	3.4	18	-10.4	1
34	5578	26.529	9733.529	+13.5	2.5	17	- 0.8	4
35	5580	28.487	9735.487	-17.8	2.2	15	-14.6	4
36	5586	30.457	9737.457	-30.5	1.7	15	-25.6	3
37	5594	Dec 7.515	9744.515	+12.2	3.0	16	+10.4	4
38	5606	13.469	9750.469	-39.1	2.9	18	-26.6	2
39	5614	25.501	9762.501	-34.1	1.7	16	-44.6	3
40	5904	1913 Jul 18.812	9967.812	-27.6	2.7	11	-17.5	2
41	5921	29.754	9978.754	-23.5	3.8	10	+ 7.8	1
42	5926	Aug 1.809	9981.809	-29.1	3.5	12	-14.9	1
43	5935	5.761	9985.761	-16.9	2.3	11		
44	5940	9.777	9989.777	- 1.4	2.2	6		
45	5951	23.737	2420003.737	-35.3	3.7	12	-10.5	2
46	5959	25.792	0005.792	-37.2	1.3	15	-17.2	2
47	5962	27.742	0007.742	-16.4	1.5	16	-11.7	2
48	5970	30.783	0010.783	+19.0	1.8	16	- 1.8	1
49	5973	31.755	0011.755	- 0.8	2.9	13	+ 7.0	2
50	5976	Sep 1.701	0012.701	+ 6.5	2.6	15	+ 7.7	1
51	5981	3.657	0014.657	-17.6	1.0	14		
52	5985	5.726	0016.726	-18.9	2.2	13	+13.3	0.5
53	5989	1913 Sep 6.687	0017.687	-13.7	8.2	5		

underexposed

underexposed

54	5994	8.728	0019.728	-13.1	±4.0	17	-12.7	1	D	
55	5997	9.664	0020.664	-27.7	3.4	10	+ 0.1	0.5	D	
56	6002	10.792	0021.792	- 3.1	5.9	3			D	much underexposed
57	6005	13.694	0024.694	+ 9.8	2.9	11	+11.6	1	D	
58	6009	23.674	0034.674	+18.8	1.9	14	+ 2.0	1	D	
59	6014	24.712	0035.712	+ 5.1	3.2	12	-13.5	1	D	
60	6017	25.649	0036.649	+ 2.0	1.9	23	- 4.8	2	D	seed 23
61	6020	27.621	0038.671	-29.6	1.5	17	-13.4	2	D	
62	6023	30.683	0041.683	-49.1	2.1	13	-35.3	1	D	
63	6026	Oct 4.701	0045.701	-12.0	1.7	15	-20.2	1	D	
64	6029	6.710	0047.710	+ 4.8	2.1	13	- 0.9	2	D	
65	6033	7.691	0048.691	+14.7	2.0	15	-36.3	1	D	
66	6037	8.638	0049.638	- 1.8	1.5	17	-19.5	0.5	D	
67	6041	9.740	0050.740	-17.0	2.6	15	-34.1	0.5	D	
68	6043	10.606	0051.606	-23.4	2.3	19	- 6.3	3	D	seed 23
69	6046	13.685	0054.685	-34.7	2.2	10			D	
70	6049	14.621	0055.621	-13.5	3.5	13	-22.7	2	D	
71	6052	15.606	0056.606	- 4.7	2.1	13	+ 8.9	2	D	
72	6057	31.622	0072.622	- 3.6	4.9	10			D	broad dust band
73	6062	Nov 2.629	0074.629	-25.2	2.0	13	-12.2	2	D	
74	6067	4.537	0076.537	-34.8	2.6	12	-47.7	2	D	
75	6070	5.661	0077.661	-29.3	4.6	12	-52.2	1	D	
76	6076	6.658	0078.658	-27.6	2.2	12	-16.5	2	D	

77	6079	14.487	0086.487	-14.4	+1.8	14	-0.4	1	D
78	6087	17.617	0089.617	-31.8	1.3	15	-18.4	2	D
79	6091	20.590	0092.590	-32.7	2.7	12	-16.0	2	D
80	6098	21.588	0093.588	-17.8	4.0	13	-17.3	1	D
81	6101	22.523	0094.523	+19.3	3.1	15	-4.4	2	D
82	6108	Dec 3.529	0105.529	+1.1	2.4	13	+2.5	1	D
83	6110	4.527	0106.527	+10.2	1.4	20	-3.6	3	D seed 23
84	6112	5.540	0107.540	+24.9	3.1	13	-3.8	2	D
85	6114	9.545	0111.545	-32.1	1.1	15			D
86	6118	11.524	0113.524	-44.1	1.9	14	-12.5	1	D
87	6124	12.561	0114.561	-51.7	1.5	15	-25.7	2	D
88	6130	13.466	0115.466	-36.4	2.1	16	-24.6	1	D
89	6136	15.517	0117.517	-5.6	1.9	13	-11.9	3	D
90	6143	19.530	0121.530	-6.1	2.2	14	-11.2	3	D
91	6149	22.534	0124.534	-42.9	2.9	11			D
92	6153	28.546	0130.546	-8.0	4.6	6			D underexposed
93	6410	1914 Jul 20.794	0334.794	-18.6	2.5	15	-18.7	0.5	D
94	6425	26.803	0340.803	+2.5	2.6	16	-15.7	2	D
95	6451	Aug 15.816	0360.816	+12.9	3.0	16	-9.4	2	D
96	6474	Sep 6.785	0382.785	-8.0	2.0	14	-5.0	2	D
97	6480	13.764	0389.764	-24.8	2.2	17	-3.6	1	D
98	6502	22.746	0389.746	+2.6	4.1	12			D
99	6517	29.697	0405.697	-35.7	3.2	13			D

100	6529	Oct 5.703	0411.703	+ 9.8	+2.6	13	D
101	6578	Nov 23.588	0460.588	+ 0.4	1.6	17	D
102	6588	Dec 15.535	0482.535	+ 7.3	2.1	15	D
103	6595	22.489	0489.489	-37.7	2.5	15	D
104	6886	1915 Dec 21.499	0853.499	-33.4	2.2	16	D
105	6906	1916 Jan 2.503	0865.503	-41.2	1.9	18	D
106	6915	8.515	0871.515	+14.7	1.8	18	D
107	7075	Aug 21.794	1097.794	+ 1.4	3.8	8	D underexposed
108	7077	28.709	1104.709	-44.1	2.4	15	D
109	7082	Sep 2.631	1107.631	- 4.9	1.8	16	D
Mean I.S. ~ -14.4							.

Daniel measured these plates in the years 1912-1916 and derived periods of 12.093 days with a good fit though large scatter and 1.09 days with only a fair fit. No solution for orbit was apparently made. The presently accepted period adopted by Struve et.al. (Ap.J. 116, 81, 1952) is 12.097 days. Daniel, of course, was unaware of the 0.17 day periods, but on account of the large scatter in the 12 day period, evidently he did spend considerable time searching for periods close to 1 day. A possibility exists of a very long period also.

123	HD 217675	o Andromedae	$\alpha = 22^h 57^m 19^s$	$\delta = +41^{\circ} 47'$	B6p
1	185 1906 Nov 4.543	2417519.548	-20.0	+3.4 12	J comparison weak
2	186 4.572	7519.572	-17.9	3.3 10	J K too faint
3	193 6.596	7521.596	-10.4	6.0 3	J plate weak
4	220 8.534	7523.584	-10.4	7.3 2	J
5	221 8.605	7523.605	-22.6	2.9 3.5	J
6	222 8.627	7523.627	-17.6	6.0 4.5	J

7	722	1907 Aug	4.742	7792.792	-13.5	*2.5	11.5	J
8	738		10.779	7798.779	- 3.4	1.4	9.5	J
9	739		10.809	7798.809	-10.1	2.7	8	J
10	759		14.789	7802.789	-18.2	2.6	15	J
11	760		14.817	7802.817	-13.9	1.2	12.5	J
12	761		14.831	7802.831	- 8.2	2.5	13.5	J
13	778		24.760	7812.760	- 6.0	0.8	6.5	J
14	779		24.817	7812.817	- 1.1	3.5	12	J
15	780		24.838	7812.838	- 9.7	3.3	11	J
16	790		28.792	7816.792	-15.8	2.2	11.5	J
17	791		28.814	7816.814	-11.0	0.3	6	J
18	792		28.834	7816.834	-10.7	3.4	8	J
19	797		30.769	7818.769	-14.5	2.5	11	J
20	798		30.802	7818.802	-13.1	1.9	11.5	J
21	799		30.822	7818.822	-19.1	0.9	14	J
22	809	Sep	1.712	7820.712	-10.3	5.7	5.5	J
23	813		5.739	7824.739	- 7.8	4.1	14.5	J
24	814		5.789	7824.789	- 8.4	1.8	16	J
25	980	Nov	14.510	7894.510	-10.4	1.3	14	J
26	981		14.547	7894.547	- 7.4	1.7	17	J
27	982		14.571	7894.571	-10.8	2.5	15.5	J
28	985		15.578	7895.578	-15.9	2.4	15	J
29	986		15.612	7895.612	-16.5	1.4	12.5	J

30	987	15.633	7895.633	-20.7	+3.6	12	J	
31	1425	1908 Jun	1.856	8094.856	-22.9	3.6	13.5	J
32	1450		5.845	8098.845	- 9.9	1.8	7.5	J
33	1457		6.867	8099.867	-21.9	2.3	8	J
34	1467		7.865	8100.865	-17.4	4.8	10	J
35	1475		8.857	8101.857	- 8.6	4.6	10	J
36	1486		11.859	8104.859	- 6.9	2.2	12	J
37	1507		17.791	8110.791	- 4.2	2.7	14.5	J
38	1541		25.790	8118.790	+21.8	2.8	3	J
39	1561		27.816	8120.816	- 9.3	1.3	6	J
40	1581	Jul	1.846	8124.846	- 9.6	1.0	7	J
41	1595		5.808	8128.808	-20.0	2.4	8	J
42	1620		9.788	8132.788	-18.2	4.2	10.5	J
43	1643		15.767	8138.767	-15.2	0.8	13	J
44	1667		19.771	8142.771	-12.7	3.4	12	J
45	1769	Aug	12.698	8166.698	-18.5	1.6	8	J
46	1789		16.776	8170.776	-14.1	2.0	7	J
47	1804		20.690	8174.690	-18.8	0.4	6	J
48	1848		26.774	8180.774	-11.8	1.4	11	J
49	2118	Nov	2.586	8248.586	- 6.4	2.1	17	J
50	2131		4.684	8250.684	- 7.0	1.6	7	J
51	2153		9.531	8255.531	-14.2	3.7	11	J
52	2172		13.556	8259.556	- 7.6	1.8	11	J

53	2882	1909 Aug	31.740	8550.740	- 7.2	±4.2	10	J
54	2912	Sep	7.752	8557.752	- 6.0	3.4	9	J
55	2927		10.743	8560.743	-12.7	0.6	8	J
56	3645	1910 Jun	13.827	8866.827	- 5.0	3.2	10	J
57	3677		28.795	8881.795	-14.4	3.4	12	J
58	3783	Sep	6.769	8921.769	-16.1	2.8	9	J
59	3837		27.784	8942.784	- 7.0	1.9	3	J
60	3843		28.696	8943.696	- 1.5	3.8	6	J
61	3894	Oct	10.660	8955.660	-12.6	5.5	7	J
62	3994		30.609	8975.609	- 6.4	5.6	5	J
63	4552	1911 Jun	30.821	9218.821	-13.2	5.6	5	J
64	4694	Aug	15.784	9264.789	-11.9	7.0	4	J
65	4769	Sep	7.701	9287.701	-23.5	2.9	3	J
66	4788		13.698	9293.698	-23.0	2.9	10	J
67	4903	Oct	28.578	9338.578	-12.4	2.9	10	J
68	5346	1912 Jun	6.816	9590.816	-40.5	1.1	2	J
69	5427	Sep	7.806	9653.806	-12.7	5.0	6	J
70	5514	Oct	16.618	9692.618	-17.8	3.8	7	J
Mean							-12.4	

The HD catalogue lists the spectrum as B5 and A2p composite. It is possible that the A2p component (HD 217676) is variable in velocity. These velocities are based on the H lines, the K line, and 4226 HeI. The 4226 HeI line agrees closely with the mean of the individual line velocities for each plate. See the note by Plaskett and Pearce (Publ. D.A.O., 5, 165, 1930).

124

HD 218045

$\alpha$  Pegasi

$\alpha = 22^h 59^m 47^s$

$\delta = +14^\circ 40'$

B9.5 III

1 2762 1909 Aug 3.864 2418522.864 + 4.7  $\pm 3.5$  7 B

2 2763 3.878 8522.878 +12.1 4.5 6 B

Mean + 8.1

125

HD 210080

7 Andromedae

$\alpha = 23^h 7^m 58^s$

$\delta = +48^\circ 52'$

F0V

1 3121 1909 Oct 13.589 2418593.589 +14.4  $\pm 1.5$  21 J

2 3135 19.603 8599.603 + 5.2  $\pm 2.1$  J

3 4709 1911 Aug 19.800 9268.800 + 4.6 2.9 9 J

4 4775 Sep 11.699 9291.699 + 8.4 1.8 20 J

126

HD 220825

$\kappa$  Piscium

$\alpha = 23^h 21^m 48^s$

$\delta = +0^\circ 42'$

A0

1 3181 1909 Nov 4.607 2418615.507 - 9.3  $\pm 1.0$  16 D

2 4670 1911 Aug 9.835 9258.835 - 3.2 2.3 15 D

3 4732 22.788 9271.788 - 7.1 2.2 13 D

4 4946 Nov 19.550 9360.550 -12.1 3.1 17 D

Mean - 8.1

127

HD 222304

18 Andromedae

$\alpha = 23^h 34^m 18^s$

$\delta = +49^\circ 55'$

B9

1 3136 1909 Oct 19.624 2418599.624 - 4.3  $\pm 1.7$  2 J

2 3145 30.600 8610.600 +25.4 1.6 2 J

3 3190 Nov 6.560 8617.560 +24.1 2.7 2 J

4 3234 15.528 8626.528 +14.4 1.7 2 J

comparison weak on  
one side

5	4047	1910 Nov	22.546	8998.546	-26.5	±14.0	3	J
6	4068	Dec	8.523	9014.523	+ 4.5	11.0	3	J
7	4867	1911 Oct	18.608	9328.608	- 1.6	13.8	2	J
8	4895		26.584	9336.584	-20.4	7.7	5	J
9	4904		28.608	9338.608	-11.9	4.5	2	J
10	4917	Nov	2.588	9343.588	+11.7	2.0	2.5	J
11	4951		21.618	9362.618	+ 2.3	4.1	3	J
12	4970	Dec	5.520	9376.520	- 2.2	5.6	3	J
13	4998		28.525	9399.525	+10.7	1.1	4	J
14	5015	1912 Jan	7.505	9409.505	-12.3	4.2	5	J
15	5478	Oct	1.646	9677.646	- 9.8	3.7	3	J
16	5587	Nov	30.507	9737.507	+ 0.8	6.8	3	J
				Mean - 2.0				

The scatter is not unduly large for a star of this spectral type, and with low individual plate weights, hence we consider it unlikely to be a spectroscopic binary.

HD 224572		$\sigma$ Cassiopeiae		$\alpha = 23^h 53^m 56^s$ (1900)		$\delta = +55^\circ 12'$		B1V
1	3182	1909 Nov	4.637	2418615.637	-12.4	± 1.4	4.5	D
2	4875	1911 Oct	19.696	19329.696	+ 1.5	3.4	3	D
3	5982	1913 Sep	3.733	20014.733	-16.5	1.2	9	D
				Mean -12.1				

## MANUAL FOR THE MEASUREMENT AND REDUCTION OF ALLEGHENY RADIAL VELOCITIES

### OLD SYSTEM - 1906-1917

This procedure is basically one of first calculating the radial velocities from a table of preliminary wavelengths and screw readings and to then adjust the radial velocities and the screw readings and finally the wavelengths, utilizing the mean deviations of the individual lines from zero residual.

The plates were first measured on the small spectrogram measuring engine which had a half-millimeter pitch screw. The plate was mounted so that the violet end of the spectrum was on the left as seen in the microscope with the emulsion up. The weight was on the left and the screw hand wheel on the right. The engine was tilted toward the measurer. The plate carriage was shifted back and forth and the plate itself rotated and translated until it was horizontal in the eyepiece field. Usually this horizontal orientation could be established by means of a dust particle on the cross hair or a horizontal reticle at the side of the eyepiece field. Once horizontal the plate was set and locked so that  $\lambda 4163$  of the Ti comparison was at the screw reading 98.61. Measure of the lines then commenced from the violet end toward the red, always moving the cross hair onto the line from the violet side so as to be raising the weight while setting and thus remove the backlash from the screw.

Two settings were made on the upper comparison line and two on the lower. The average of these was recorded on the measuring sheet as the "direct" comparison reading. Three settings were made on each measuring sheet as the "direct" star reading. The procedure used in setting on the center of the line was to balance the black on either side of the cross hair for the case of the comparison line and to balance the white on either side of the cross hair for the case of

the star line. Allowance for grain irregularity would have to be made when necessary.

The procedure, so far, was similar to that of all observatories, however, the small measuring engine was unique in regards to reversal of the plate. Rather than reverse the plate and go through the entire setup procedure, the entire machine was reversed without it being necessary to touch the plate.

The measuring engine sat on a wooden base which could be merely turned around. The machine was now tilted again toward the measurer. This placed the weight at the right and the screw wheel at the left. The readings were repeated as before but this time from red to violet and recorded on the measuring sheets as "reverse". The chief difference in this respect was that the reversed readings were made with the weight rather than against the weight. In other words, rather than raising the weight while making the setting, the weight is lowered while making the setting in reverse. This meant that one side of the screw thread received wear during the direct reading while the other side received wear during the reverse reading. Normally, only one side of the screw receives wear when the plate is reversed, since the measure is made against the weight direct and reversed.

The early measures, themselves, are probably all right because the half-millimeter pitch resulted in a minimum of backlash with a tight nut. The later measures (the ones being reduced now) may not be so good since the wear on both sides of the thread resulted in the screw wearing out completely by 1917. The technique for setting on the comparison lines varied somewhat with the measurer. Some measurers set on the tips of the comparison lines; some about one third of the way from the tip and some on the whole line. The correction applied varied from  $-0.2$  km/sec. for a setting on the tip to  $-0.5$  km/sec. for a setting on the whole line.

We turn our attention now from the measuring technique to the arrangement of

the measuring sheet. Two types of measuring sheets were used. The arrangement of the data on these sheets, however, was basically the same for both.



**ALLEGHENY OBSERVATORY.**

Star Uigoe  
Date 1912 Feb 23  
7:00

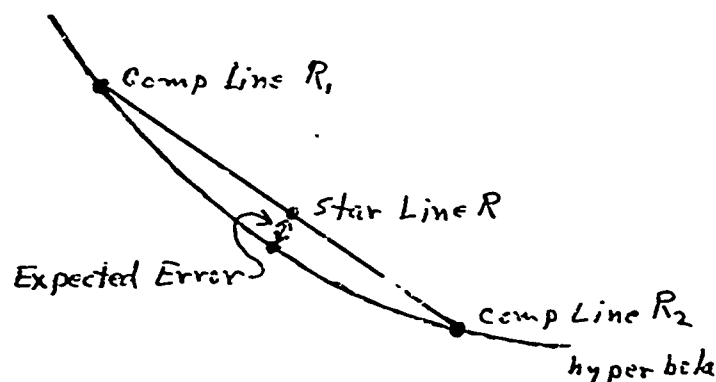
Plate No. 5090  
Measured by Sehl  
1912 Apr. 1

Scale. -0.3 ✓  
 Curv. -27.5 ✓  
 $v$ . -0.11 ✓  
 $v_s$  -2792 ✓  
 Sum +1.5 ✓ + 47.38 ✓ + 47.6 ✓  $P_c = \pm 2.4$

[illegible]

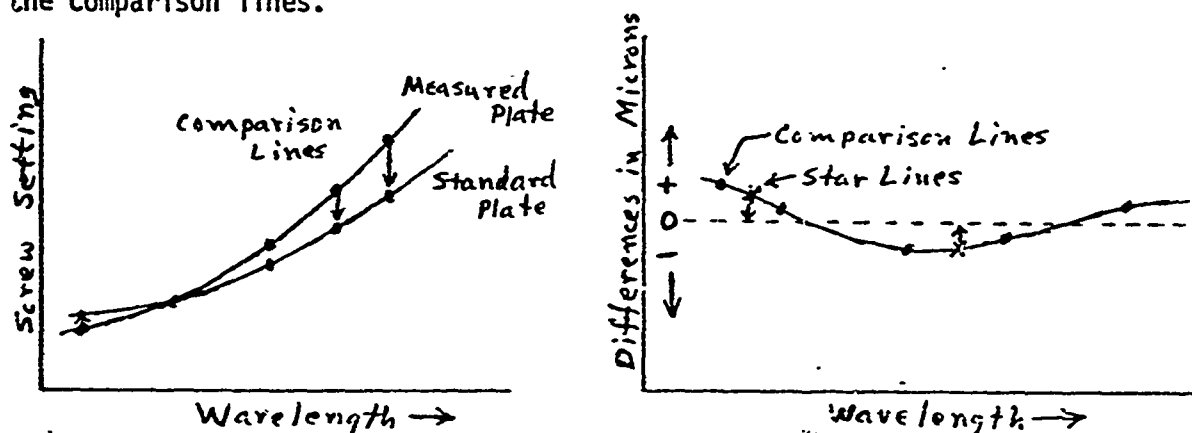
Type I was the original measuring sheet in use. Used in 1907, it was replaced by Type II about April 1908. Type II was in use then for the remainder of the program.

The reduction of the measures to give radial velocity was basically that of converting the deviation of the measures from a standard table of measures into radial velocity. Schlesinger, as is customary with all observatories using the Standard Table reduction method, had to set up his own table for the Mellon Spectrograph. Such a table is dependent on the dispersion of the spectrograph as well as the characteristics of the prisms, lenses, and other components. Thus each spectrograph requires its own table. What Schlesinger did was to take four plates during the winter and four during the summer. The average comparison settings for each of these two series were compared with each other using  $\lambda$  4164 for the common setting. The deviation in scale due to the summer-winter temperature difference, was found to be very nearly linear. Fitting the differences in dispersion to a smooth parabola, he then determined what error would be expected by interpolating a star line between two comparison lines on the parabola, linearly, rather than along the parabola.



The maximum error between two plates was determined from the fact that the temperature difference here was maximum, he chose the greatest distance available between comparison lines, and assumed the star line to be half way between. This led to a maximum error of 0.14 km/sec. Since this error was sufficiently small,

he concluded that no sensible error is involved by assuming that, for short distances, the differences of dispersion may be considered as linear. Schlesinger's linear interpolation method differs from the Standard Table reduction method commonly used today, in that, now one reduces the star lines to the standard table using a plot of the differences between the measures and the table for the comparison lines.



The difference, then between the reduced setting of the star line and the standard setting in microns, is converted directly to radial velocity using  $dV/dR$  values similar to Schlesinger's. In this case, the standard plates were measured and averaged to determine the standard screw setting for each comparison line that was not obviously blended. From these readings, a Hartmann reduction was used to compute the observed wave lengths of the comparison lines. The formula used first was

$$(\lambda_0 - 2304.4) (211.09 - R) = [5.3204664]$$

where  $\lambda_0 = 2304.4$ ,  $R_0 = 211.09$ , and  $\log c = 5.3204664$ . These  $\lambda$ 's were compared to the Rowland  $\lambda$ 's and the differences  $\Delta\lambda$  incorporated into the above formula to reduce the standard settings to the Rowland  $\lambda$  system as so:

$$(\lambda_0 + \Delta\lambda - 2304.4) (211.09 - R) = [5.3204664]$$

The constants here were evidently revised about 1907 since the  $\theta$  Aquilae reduction as well as all subsequent reductions used  $\lambda_0 = 2305.592$ ,  $R_0 = 211.208$ , and  $\log c = 5.3206322$ . Table A and Table B in A.O. Publ. 2, p. 13-14 list the

wavelengths of the comparison lines, the normal screw settings of the comparison lines, and  $dv/dR$ , the radial velocity corresponding to a displacement of one turn of the screw.

For each star now the lines to be measured (star and comparison) were chosen. The choice generally consisted of all good star lines and those comparison lines which bracketed each star line. A master list of preliminary wave lengths of the star lines was adopted on November 7, 1907, mostly from Rowland's solar wave lengths. A few wavelengths came from other sources such as Hartmann, Frost, Runge, and Paschen, etc. Standard screw settings for these star lines were computed from the Hartmann formula. These screw settings along with those for the chosen comparison lines were then used to compute once and for all, a table of four quantities which were entered on a 3" x 5" card. (A card was made up for each star). These quantities were:

Rough Screw Setting	$(R_2 - R_1)_{\text{Norm.}}$	$(R - R_1)_{\text{Norm.}}$	$k = \frac{R - R_1}{R_2 - R_1}$	$\frac{dv}{dR}$

The plates were measured, top and bottom settings on the comparison lines and star line settings, both direct and reversed. Each star line was weighted on a scale from 1 to 4, depending on how easily and accurately the settings could be made. A few weights of 1- were recorded, which have been assigned the value  $\frac{1}{2}$  in these reductions. A well defined line, which was easily bisected and for which the three settings agreed very well with each other, was given high weight, say 3 or 4. Mean values of the comparison settings and star settings were computed. Those means on either side of the star line being  $R_1$  and  $R_2$  and then mean

star setting being  $R$ . The measured values  $R - R_1$  and  $R_2 - R_1$  were computed for each line and the velocity of each line, then computed from the formula,

$$v_s = \{ (R - R_1) - (R - R_1) - [ (R_2 - R_1) - (R_2 - R_1) ] k \} \frac{dV}{dR}$$

The weighted average of the line velocities  $v_s$  yielded the plate velocity, which when corrected for diurnal and annual motion of the earth gave the star velocity for the plate. This star velocity was considered a preliminary velocity.

Now it so happens that the adopted Rowland wavelengths were for the sun at very high dispersion. There is no reason to believe that for a star of very different temperature and pressure, these wavelengths are the same. Moreover, the blending ratios will probably be very different and of course, low dispersion makes blending much more serious for the case of the Allegheny spectrograms. Hence the adopted Rowland wave lengths should not be the actual wavelengths of the star in question at the dispersion used. Each line, therefore, has a wavelength error, which should yield a systematic error or deviation from the plate velocity. Individual deviations in km/sec. were tabulated for each star line for all plates of a star and each was multiplied by the weight of the line. Then a weighted mean deviation was computed for all plates. This weighted mean was used to correct the star line in question. For instance, if  $\lambda 3933$  or  $R = 82.7$ , we derive a mean residual error of  $-2.7$  km/sec. Then for each plate, the line velocity  $v_s$  of  $\lambda 3933$  is corrected by adding  $+ 2.7$  km/sec. Having done this for each line a new weighted mean of the corrected  $v_s$ 's yielded a corrected plate velocity and a corrected, or final star velocity. These corrected entries were made on the measuring sheets with red ink. The correction for each line was also used to correct the adopted Rowland wavelengths to the "true" wavelengths.

First the screw readings were corrected and then the "true" wave lengths were computed for the corrected screw readings. The screw readings were corrected with the formula,

$$\frac{\Delta v_s}{\frac{dV}{dR}} = \frac{\Delta R}{T}$$

For example for our  $\lambda 3933$   $\Delta v_s = -2.7$  km/sec. and  $\frac{dV}{dR} = 969$

$$\frac{-2.7}{969} = \frac{\Delta R}{1}$$

$$\Delta R = -0.0028$$

$$R_{\text{norm}} = 82.7284$$

$$R_{\text{true}} = 82.7256$$

Using  $R = 82.7256$ , the Hartmann formula was used to compute the "true"  $\lambda$  of 3933.789 ( $\theta$  Aquilae). This procedure was followed for each star line and the results published for each star. The result was that each star had slightly different final  $\lambda$ 's due primarily to differences in blending.

A master table of the adopted wavelengths and screw readings and reduction coefficients follows on the next page.

One complication in these radial velocities, is the matter of interstellar H and K lines. While the different character (ie. the sharpness and non-variability) of these lines were recognized in those days, their true nature was not known. It is now known that they originate from absorption in the ground state of ionized calcium atoms in interstellar space and primarily in gas clouds of the spiral arms. Velocities derived from them are distinct from the velocity of the star and should not be averaged into the plate velocity. In the old measures, these were averaged into the plate velocity in many cases. When so done, they must be removed from the plate velocities and expressed separately. A list of those stars in which H and K is interstellar, follows also.

TABLE OF ADOPTED WAVELENGTHS

$\lambda$ comp. (Rowland)	R comp. (*Regularly used)	$\lambda$ star	R star	Ident.	Spectral Range	$\frac{dV}{dR}$
3924.673	* 82.0026	3926.678	82.1627	He	09.5-B5	962
3930.022	82.4286					
		3933.825	82.7284	(Cat (K)	(IS09.5-B5), B6-B9.5, A0-A8	969
		3936.064	82.9047	He		
		3943.919	83.5190		B6-B9.5	978
		3956.819	84.5154	Fe		
3958.355	* 84.6381					
3962.995	84.9872					
3964.416	85.0932					
		3964.875	85.1296	He	09.5-B5	998
		3968.625	85.4135	Ca (H)	(IS09.5-B5)	999
		3970.177	85.5307	He		1000
		3984.109	86.5722		B6-B9.5	1016
3989.912	87.0006					
		3995.190	87.3885		09.5-B5	
3998.790	* 87.6524					
		4005.408	88.1317	Fe		1036
		4009.417	88.4209	He	09.5-B5, B6-B9.5	1039
4012.541	88.6459	4012.541	88.6453	Ti	A0-A8	1042

4017.925	89.0300	Ti		1073
4024.136	89.4798	He		1074
4025.043	89.5320			1054
4026.370	89.6284	He (blend)	09.5-B5, B6-B9.5	1056
4028.497	89.7785	Ti		1058
4030.646	89.9282	Fe-Ti	A0-A8	1060
4045.975	90.9949	Fe	A0-A8, F0-F8	1075
4048.930	91.1989	Fe		1079
4053.981	91.5461			
4060.415	91.9025			
4063.759	92.2092	Fe	A0-A8, F0-F8	1093
4067.284	92.4468	Fe (blend)		1096
4069.946	92.6257		09.5-B5	1099
4072.342	92.7863			1101
4077.630	93.1391		A0-A8, F0-F8	
4078.631	93.2048			
4089	93.9058		09.5-B5	1117
4102.000	94.7378	H <sub>2</sub>	B6-B9.5, A0-A8, F0-F8	1129
4121.015	95.9557	He (blend)	B6-B9.5	1147
4128.204	96.4096	Si	B6-B9.5, A0-A8	1155
4131.040	96.5876	Si	B6-B9.5, A0-A8	1157
4137.061	96.9641		B6-B9.5	1163
4143.572	97.3681	Fe	A0-A8, F0-F8	1170

4163.818	* 98.6079	4143.919	97.3892	He	09.5-B5,	B6-B9.5	1170
		4154.667	98.0500	Fe		A0-A8	1181
		4163.818	98.2092	Ti			1184
4172.066	99.1028	4169.131	98.9267	He	09.5-B5		1195
4186.280	99.9490	4179.246	99.5319			A0-A8	1206
		4187	100.02			A0-A8	1214
		4198.800	100.6835	Fe		A0-A8, F0-F8	1226
		4206.211	101.1137		09.5-B5?	B6-B9.5, A0-A8	1233
		4215.703	101.6599	Srt		A0-A8, F0-F8	1242
		4226.904	102.2974	Ga		A0-A8, F0-F8	1253
		4233.328	102.6598	Mn - Fe		B6-B9.5, A0-A8, F0-F8	1260
		4242.535	103.1748	Cr			1270
4263.290	*104.3178	4250.657	103.6252	Fe (blend)		A0-A8	1277
4274.746	104.9395	4267.301	104.5364	C	09.5-B5,	B6-B9.5	1294
		4271.657	104.7724	Fe (blend)		A0-A8, F0-F8	1299
		4275.476	104.9784			A0-A8	
		4290.080	105.7586	Ti		A0-A8, F0-F8	1317
4294.204	1105.9799	4290.377	105.7747	Ti		A0-A8, F0-F8	1318

4295.914	106.0660	4314	107.06	M	
4313.034	106.9634	4321.119	107.3804	Fe	1353
		4325.938	107.6268	Fe	A0-A8,F0-F8, M 1355
		4337	108.23	M	
4338.084	*108.2450	4340.634	108.3744	H <sub>δ</sub>	B6-B9.5, A0-A8,F0-F8, M 1370
		4352.083	108.9474	Mg	A0-A8,F0-F8, 1382
4367.839	109.7305	4375.103	110.0827	Mn	1406
		4384.477	110.5378		A0-A8,F0-F8, M 1415
		4388.100	110.7149	He	B6-B9.5, 1419
		4391.146	110.8506	Fe-T <sub>1</sub>	A0-A8 1422
4399.935	*111.2818	4395.	111.07	M	
		4400	111.32	M	
		4404.927	111.5165		A0-A8,F0-F8, M 1436
		4408	111.69	M	
4434.168	112.8858	4437.718	113.0501	He	09.5-B5 1470
		4443.976	113.3369	Ti	A0-A8,F0-F8 1477
4455.485	113.8602				
4457.600	*113.9556				

4468.7	114.4529	4462.165	114.1570	Fe-Mn	A0-A8	1496
		4468.663	114.4523	Ti		1503
		4471.676	114.5867	He (blend)	86-89.5	1506
		4481.397	115.0177	Mg	B6-B9.5, A0-A8, F0-F8, M	1516
		4481.438	115.0195 (0214)	Ti	09.5-B5?	
		4489	115.39			M
4496.318	115.6720	4496	115.70			M
4501.448	*115.8942	4501.448	115.8942	Ti		1536
		4508.455	116.1975	Fe		1543
4512.906	116.3888	4515.508	116.5002	Fe	A0-A8	1550
		4518	116.62			M
4522.974	116.8188	4523	116.83			M
4527.490	117.0099	4534.139	117.2908	Ti	A0-A8, F0-F8,	1572
		4535	117.35			M 1574
4544.864	*117.7402	4549.808	117.9454	Ti-Co	B6-B9.5, A0-A8, F0-F8	1588
4552.632	118.0580	4552.857	118.0717		09.5-B5	1592

4555.662	*118.1840				
		4558.827	118.3180	Cr	A0-A8
					1600
4617.452	120.6694	4572.156	118.8634	Tf	1616
4623.279	120.8956		0.5		
4667.768	122.5931				
4682.088	123.1245				
4742.979	125.3178				
4841.074	*128.6321				
4856.203	129.1190				
		4861.527	129.2900	H <sub>B</sub>	09.5-B5, B6-B9.5, A0-A8
					1928
4885.265	*130.0420				

\* These lines were used in the majority of cases.

TABLE OF STARS HAVING INTERSTELLAR H &amp; K

Star	1900 $\alpha$	Sp. V.	Star	1900 $\alpha$	Sp. V.	** Definite	I.S. Lines
$\delta$ Peg	0 <sup>h</sup> 8 <sup>m</sup>	B2 0	$\beta$ Sco	15 <sup>h</sup> 60 <sup>m</sup>	B2 -12.1	20 Tau	3 <sup>h</sup> 40 <sup>m</sup>
$\pi$ And	0 <sup>h</sup> 32 <sup>m</sup>	B4 -1.8	38 Oph (U Oph)	17 <sup>h</sup> 11 <sup>m</sup>	B5n -17.8	$\lambda$ Tau	3 <sup>h</sup> 55 <sup>m</sup>
$\circ$ Cas	0 <sup>h</sup> 39 <sup>m</sup>	B4ne -6.5	66 Oph	17 <sup>h</sup> 53 <sup>m</sup>	B5ne -16.6	$\pi$ 4 Ori	4 <sup>h</sup> 46 <sup>m</sup>
68 Cas	0 <sup>h</sup> 39 <sup>m</sup>	B5n -3.0	A Aq1 (4 Aq1)	18 <sup>h</sup> 40 <sup>m</sup>	B7n -19	9 Cam ( $\alpha$ Cam)	4 <sup>h</sup> 44 <sup>m</sup>
$\nu$ And	0 <sup>h</sup> 44 <sup>m</sup>	B5 -3.0	$\beta$ Lyr	18 <sup>h</sup> 46 <sup>m</sup>	Bep -18.0	$\beta$ Ori	5 <sup>h</sup> 10 <sup>m</sup>
$\phi$ Per	1 <sup>h</sup> 37 <sup>m</sup>	B0ne -6.6	$\delta$ Lyr	18 <sup>h</sup> 50 <sup>m</sup>	B3 -17	$\eta$ Ori	5 <sup>h</sup> 19 <sup>m</sup>
$\xi$ Ari	2 <sup>h</sup> 19 <sup>m</sup>	B8 +4.3	$\iota$ Lyr	19 <sup>h</sup> 4 <sup>m</sup>	B6n -14	$\delta$ Ori	5 <sup>h</sup> 20 <sup>m</sup>
35 Ari	2 <sup>h</sup> 28 <sup>m</sup>	B3 +4.6	$\eta$ Lyr	19 <sup>h</sup> 11 <sup>m</sup>	B5 -12.6	$\alpha$ Ori	5 <sup>h</sup> 29 <sup>m</sup>
$\circ$ Per	2 <sup>h</sup> 38 <sup>m</sup>	B2 +10.2	1 Vul	19 <sup>h</sup> 12 <sup>m</sup>	B5n -16	$\theta$ Ori	5 <sup>h</sup> 30 <sup>m</sup>
1717 Tau	3 <sup>h</sup> 40 <sup>m</sup>	B5ne +18.2	2 Sgr	19 <sup>h</sup> 16 <sup>m</sup>	Aev -8	$\iota$ Ori	5 <sup>h</sup> 30 <sup>m</sup>
19 Tau	3 <sup>h</sup> 39 <sup>m</sup>	B7n +14.0	2 Cyg	19 <sup>h</sup> 20 <sup>m</sup>	B5 -15	$\epsilon$ Ori	5 <sup>h</sup> 31 <sup>m</sup>
20 Tau	3 <sup>h</sup> 40 <sup>m</sup>	B9 +15.0	$\sigma$ Aq1	19 <sup>h</sup> 35 <sup>m</sup>	B3 -14.0	125 Tau	5 <sup>h</sup> 34 <sup>m</sup>
21 Tau	3 <sup>h</sup> 40 <sup>m</sup>	B9n +16.0	Groom 2950 (V380 Cyg)	19 <sup>h</sup> 47 <sup>m</sup>	B2 -16.2	$\zeta$ Ori	5 <sup>h</sup> 36 <sup>m</sup>
23 Tau	3 <sup>h</sup> 40 <sup>m</sup>	B5ne +16.9	Groom 2984	19 <sup>h</sup> 54 <sup>m</sup>	B5n -14	$\xi$ Ori	6 <sup>h</sup> 6 <sup>m</sup>
27 Tau	3 <sup>h</sup> 43 <sup>m</sup>	B9n +14.5	25 Cyg	19 <sup>h</sup> 56 <sup>m</sup>	B3e -18	5 Mon	6 <sup>h</sup> 36 <sup>m</sup>
$\epsilon$ Per	3 <sup>h</sup> 51 <sup>m</sup>	B1n +9.1	28 Cyg	20 <sup>h</sup> 6 <sup>m</sup>	B3ne -20	$\eta$ Lyr	19 <sup>h</sup> 11 <sup>m</sup>
$\xi$ Per	3 <sup>h</sup> 52 <sup>m</sup>	07n +11.7	+25 <sup>o</sup> 4165	20 <sup>h</sup> 11 <sup>m</sup>	B3n -14	57 Cyg	20 <sup>h</sup> 50 <sup>m</sup>
$\lambda$ Tau	3 <sup>h</sup> 55 <sup>m</sup>	B3 +20.8	$\omega$ Cyg	20 <sup>h</sup> 27 <sup>m</sup>	B3n -14	A Cyg	21 <sup>h</sup> 15 <sup>m</sup>
$\pi$ 4 Ori	4 <sup>h</sup> 46 <sup>m</sup>	B2 +23.2	28 Vul	20 <sup>h</sup> 34 <sup>m</sup>	B7n -14	2 Lac	22 <sup>h</sup> 17 <sup>m</sup>
9 Cam ( $\alpha$ Cam) $\beta$ Ori	4 <sup>h</sup> 41 <sup>m</sup>	09e -6.0	$\alpha$ Cyg	20 <sup>h</sup> 38 <sup>m</sup>	cA2e -10.0	12 Lac	22 <sup>h</sup> 38 <sup>m</sup>
	5 <sup>h</sup> 10 <sup>m</sup>	cB8e -15.7	57 Cyg	20 <sup>h</sup> 50 <sup>m</sup>	B3 -17	16 Lac	22 <sup>h</sup> 52 <sup>m</sup>

n Ori	5 <sup>h</sup> 19 <sup>m</sup>	B0	+10.8	A Cyg (68 Cyg)	21 <sup>h</sup> 15 <sup>m</sup>	08n	-13.3	1 Cas	23 <sup>h</sup> 2 <sup>m</sup>
δ Ori	5 <sup>h</sup> 20 <sup>m</sup>	B2	+21.6	9 Cep	21 <sup>h</sup> 35 <sup>m</sup>	cB2	-22.2		
ψ Ori	5 <sup>h</sup> 24.2 <sup>m</sup>	B2	+14.1	16 Peg	21 <sup>h</sup> 48 <sup>m</sup>	B3e	- 9		
δ Ori	5 <sup>h</sup> 27 <sup>m</sup>	B0	+13.9	30 Peg	22 <sup>h</sup> 15 <sup>m</sup>	B6	- 6		
VV Ori	5 <sup>h</sup> 29 <sup>m</sup>	B2n	+19.2	31 Peg	22 <sup>h</sup> 17 <sup>m</sup>	B3e	- 8		
(-1 <sup>0</sup> 843)	5 <sup>h</sup> 29 <sup>m</sup>	B0	+16.5	32 Peg	22 <sup>h</sup> 17 <sup>m</sup>	B8n	- 8		
θ Ori	5 <sup>h</sup> 30 <sup>m</sup>	07	+20	2 Lac	22 <sup>h</sup> 17 <sup>m</sup>	B5	-15		
ι Ori	5 <sup>h</sup> 30 <sup>m</sup>	08	+27.4	4 Lac	22 <sup>h</sup> 20 <sup>m</sup>	cB8	-18		
ε Ori	5 <sup>h</sup> 31 <sup>m</sup>	B0e	+18.8	6 Lac	22 <sup>h</sup> 26 <sup>m</sup>	B3	-10.6		
125 Tau	5 <sup>h</sup> 34 <sup>m</sup>	B3	+16.6	10 Lac	22 <sup>h</sup> 35 <sup>m</sup>	09	-14.0		
ζ Ori	5 <sup>h</sup> 36 <sup>m</sup>	B0ne	+19.6	12 Lac	22 <sup>h</sup> 38 <sup>m</sup>	B1	-16.0		
ξ Ori	6 <sup>h</sup> 6 <sup>m</sup>	B3n	+13.0	16 Lac	22 <sup>h</sup> 52 <sup>m</sup>	B3	-13.2		
5 Mon	6 <sup>h</sup> 36 <sup>m</sup>	07	+15.2	o And	22 <sup>h</sup> 57 <sup>m</sup>	B7n	-11.2		
η CMa	7 <sup>h</sup> 20 <sup>m</sup>	cB7	+22.9	1 Cas	23 <sup>h</sup> 2 <sup>m</sup>	cB1	-11		
-15 <sup>0</sup> 1810	7 <sup>h</sup> 20 <sup>m</sup>	B3e	+18.3	δ Cas	23 <sup>h</sup> 54 <sup>m</sup>	B3n	- 9		

# REDUCTION TABLE

Example of reduction for the star  $\alpha$  And

Ti comp.	R comp.	$R_2 - R_1$	$R_2 - R_1$
3925	82.0026		
3930	82.4286	2.6355	
3958	84.6381		2.5586
3963	84.9872		
3964	85.0932	3.0143	2.0134
3990	87.0006		
3999	87.6524		
4079	93.2048		
		5.4031	
4164	98.6079		
4172	99.1028	5.7099	
			5.2150
4263	104.3178		
		3.9272	
4338	108.2400		
			3.0368
4400	111.2818	5.7106	
4458	113.9556		4.6124
			1.9386
4501	115.8942		

* Line	R star	$(R_2 - R_1)_N$	$(R - R_1)_N$	$k = \frac{R - R_1}{R_2 - R_1}$	$\frac{dV}{dR}$	(X 1000)
3934 Cu II (k)	82.7284	2.6355	0.7258	0.2754	0.969	
	82.7284	2.5586	0.2998	0.1172	0.969	
3944	83.5190	2.6355 (2.559)	1.5164 (1.090)	0.5754 (0.426)	0.978	
3984	86.5722	3.0143	1.9341	0.6416	1.016	
	86.5722	2.0134	1.5850	0.7872	1.016	
	88.421	2.0134	1.769	0.8615	1.039	(B) HC
	89.628	2.126	1.976	0.9294	1.056	B HC
4102 H <sub>δ</sub>	94.7378	5.4031	1.5330	0.2837	1.129	
4128 SiI	96.4096	5.4031	3.2048	0.5931	1.155	
4131 SiI	96.5876	5.4031	3.3828	0.6261	1.157	
4137	96.9641	5.4031	3.7593	0.6958	1.163	
	97.389	5.403	4.184	0.7743	1.170	B
4206	101.1137	5.7099	2.5058	0.4389	1.233	
	101.1137	5.2150	2.0109	0.3856	1.233	
4267 Cl	104.5364	3.9272	0.2186	0.0557	1.294	
4341 H <sub>δ</sub>	108.3744	5.7106	0.1294	0.0227	1.370	
	108.3744	3.0368	0.1294	0.0426	1.370	
	114.587	1.939	0.631	0.3254	1.506	(He blend B)
4481 Mg II (b1)	115.0177	1.9386	1.0621	0.5479	1.516	
	115.0177	4.6124	3.7359	0.8100	1.516	

Replace v column with  $\Delta(R-R_1) = ([R-R_1]_M - [R-R_1]_N)$

Replace p.v. column with  $\Delta (R_2 - R_1) \quad k = ([R - R_1]_M - [R_2 - R_1]_N) k$

$$V = \{ \Delta (R - R_1) - \Delta (R_2 - R_1) \quad k \} \quad \frac{dV}{dR}$$